REPORT OF THE EXTERNAL EVALUATION PANEL OF THE BEAN/COWPEA CRSP FOR FY 87

February 25-27, 1988

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THE EXTERNAL EVALUATION PANEL OF
THE BEAN/COWPEA COLLABORATIVE RESEARCH SUPPORT PROGRAM
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I. Introduction

The Bean/Cowpea Collaborative Research Support Program (CRSP) began with funding in September 1980. This original Bean/Cowpea CRSP grant came to an end during FY 86, and a new extension grant was awarded. The present review report covers FY 87 activities, the second year of the three-year extension. Included as a part of this review are the Panel's comments on individual proposals for a second extension for the period FY 89 through FY 92.

Evaluations reported here are based on project annual reports and on-site reviews. EEP members reviewed CRSP activities in Dominican Republic, Guatemala, Malawi, Michigan, Nigeria, Puerto Rico and Tanzania. Management Office and AID officials provided additional information.

A. The FY 87 External Evaluation Panel (EEP)

Originally the EEP consisted of seven members, all appointed in 1980-81. During 1986, two members--Dr. Melvin Blase and Dr. Luis H. Camacho--retired from the EEP, reducing the number of members to five. In 1987, another two of the original seven retired--Dr. Antonio M. Pinchinat and Dr. Charlotte E. Roderuck. They were replaced by Dr. Edna McBreen and Dr. Kenneth O. Rachie. Current members and their affiliations are given in Attachment C.

B. Organization of the Bean/Cowpea CRSP

When it was organized, the Bean/Cowpea CRSP was comprised of eighteen projects in thirteen countries of Africa and Central and South America in collaboration with ten US lead institutions (nine Land Grant universities and one private institution). At the end of FY 87, there were thirteen projects for review (beans--eight and cowpeas--five). Several of the original projects were terminated or consolidated. The thirteen remaining projects are located in eleven countries and are conducted by eleven US lead institutions.

Host Country	Crop	US Institution
Botswana	Cowpeas	Colorado State University
Brazil	Cowpeas	Boyce Thompson Institute
Brazil	Beans	University of Wisconsin
Cameroon	Cowpeas	Purdue University
Dominican Republic	Beans	University of Nebraska
Guatemala	Beans	Cornell University
Guatemala/INCAP	Beans	Washington State University
Honduras	Beans	University of Puerto Rico
Malawi	Beans	Michigan State University
Mexico	Beans	Michigan State University
Nigeria	Cowpeas	University of Georgia
Senegal	Cowpeas	University of California-Riverside
Tanzania	Beans	Washington State University

The Bean/Cowpea CRSP projects are developed and executed by Principal Investigators (PIs) in collaborating US and Host Country (HC) institutions. Oversight and participation in the approval of plans and budgets are made by the Technical Committee (TC), Management Entity/Management Office (ME/MO) and the Board of Directors (BOD).

C. FY 87 EEP Review: Sequence of Events

The following are events which comprised the FY 87 EEP Review process:

1. A Scope of Work (see Attachment A) was developed by the Chair of the EEP and the Program Director/MO, using the AID Guidelines and input from the TC and the BOD. This Scope of Work was distributed to the Principal Investigators to guide the preparation of the annual reports which were due in the MO by December 1, 1987.

2. Annual reports for FY 87 of individual projects and proposed extensions for FY 89-92 were sent to EEP members in December 1987 and January 1988.

3. Each EEP member was assigned three to four projects or topics for intensive study/review prior to the EEP meeting in San José, Costa Rica, February 22-26, 1988. Draft reviews as assigned were prepared by EEP members in advance and, where applicable, included information from EEP reviews at Host Country sites.

4. Draft reviews were discussed at the February meeting. Final evaluations were made on the basis of these discussions and additional information received as requested from the MO and the AID Program Officer.

5. A fiscal and administrative management evaluation was made from data provided by, and from discussions with, the MO.

6. Discussions were held with the AID CRSP Program Office and the Director of the Bean/Cowpea CRSP Management Office with regard to funding of the CRSP, relations/operations with AID/W and USAID Missions, and other matters of mutual interest.

7. Summary, overall evaluation of the Bean/Cowpea CRSP was made on the basis of the results of the individual project reviews, information provided by the MO and discussions with officials of the MO.

8. Following the week of deliberations, a draft EEP Report was prepared February 25, 1988 and discussed with the TC, MO and BOD on February 26, 1988.

II. Program Evaluation: Summary

For the FY 87 review, eleven individual CRSP projects were evaluated with special regard to progress, funding/fiscal management, planning and status/-prospects. Because of their status and special circumstances, two projects were not given full reviews and ratings. Five projects were rated Highly Satisfactory; five Satisfactory; and one Satisfactory with the comment that CRSP officials may wish to consider major adjustments.

The Bean/Cowpea CRSP has evolved over the years, winnowing out less successful projects and developing and strengthening others. In FY 87 it included thirteen projects and a supporting activity, Women in Development (WID). Of these, one on cowpeas in Botswana essentially ended with FY 87. The twelve remaining projects include four in cowpeas (three in Africa) and eight on beans (two in Africa). The work proposed in FY 88 could strengthen work on biological nitrogen fixation in beans in the Caribbean and adjacent nations, develop the use of molecular biology and genetics to control the bean golden mosaic group of diseases in the same region, and add a study of the economics of production and marketing of cowpeas in Senegal.

In each project, research in one or more US universities is linked to academic or research initiatives in one or more collaborating HCs. Though the details vary between projects, the EEP is satisfied that the work in the US, in general, provides effective support to the work in the HCs and, in addition, produces results likely to be useful in agriculture in the US.

A number of significant topics appear to require particular attention by all projects in the future. They are:

A. The study and design of procedures and protocols in each project for transferring practical useful results to farmers and others who wish to use them, through the institutions and processes actually available or in prospect in the HCs.

B. In particular, in all projects which include crop improvement, the development, by appropriate agencies in the nation, of procedures to multiply and certify seed and other planting materials and distribute them to growers.

C. The description, evaluation, documentation and conservation of plant genetic resources, in cooperation with national authorities and international centers, including IBPGR.

D. The establishment of working links between projects which share interests in particular topics such as biological nitrogen fixation; the hard-to-cook phenomenon in legume seeds; other aspects of food technologies; multiple resistances to plant diseases; water relations and adaptations to dry conditions; and socio-economic and socio-technical studies.

The rapid advances of knowledge and methods in biotechnology (especially immunology, regeneration of plantlets in tissue cultures, and the isolation and transfer of individual genes) make it necessary to strengthen and develop the

means by which the advances can be extended and exploited in less-developed countries. The CRSP model clearly offers a most suitable way of doing this, as the Peanut CRSP project on the rosette viruses in Nigeria has already demonstrated. The work on the bean golden mosaic viruses referred to above should permit comparable links in this CRSP.

Such linkages will also support the increased emphasis this CRSP intends to place on helping cooperating nations to strengthen their crop improvement and development systems in beans and cowpeas. In addition, they will make the research on these crops more relevant and the dissemination of the results more effective.

The CRSP, which is and must continue to be concerned with cooperative research and the strengthening of national research systems on beans and cowpeas, will need to strengthen its associations with AID at all levels from the USAID Missions to AID/Washington.

Numbers in degree training are particularly impressive in light of budget cuts; however, short-term training may not have been used to the greatest advantage. With available data summaries, it is not possible to determine the appropriateness of training in relation to broader aspects of professional responsibilities of students upon return to the HCs.

Centralized WID activities have clearly been, and continue to be, an element of success of the overall CRSP. As the CRSP projects begin to validate results with on-farm trials, it will become particularly important for researchers to consider the gender effect on technology adoption. The EEP strongly encourages the PIs to include gender considerations in their proposals where appropriate.

In response to budget cuts, the MO has been reduced to 3.55 FTEs. No one at present is a full-time employee of the CRSP. As a result, many activities of the MO have been curtailed. In spite of the cuts, and because of the skills of the management staff, the activities they are doing are extremely well done.

Fiscal management in the MO appears to be well in hand. The legal and accounting requirements and financial reporting carried out by the MSU Contract and Grant Officer appear to have been impeccable with respect to receipted payments but do not appear to be able to handle adequately funds committed but not yet spent or longer-term forward commitments.

Summary Comments on the Bean/Cowpea CRSP

Progress: Satisfactory.

There is steady progress toward the achievement of objectives, especially with regard to strengthening institutions and developing capacity to conduct national bean improvement programs.

Funding and Fiscal Management: Satisfactory.

Recent budget reductions have been deep and sudden, producing disruptions and dislocations. CRSP authorities--BOD, ME and TC--arranged to absorb the funding reductions in ways to minimize the damage while maintaining the integrity of the CRSP. Projects were wounded but they were not disabled. Nevertheless, the BOD may wish to determine if personnel and funding reductions have compromised the ability of the ME/MO to monitor and supervise projects and to promote and pursue buy-in opportunities at the country-Mission level.

Management: Very Satisfactory.

Within the limitations imposed by budget reductions, the ME/MO has performed in a very satisfactory fashion.

Planning: Satisfactory.

The recent performance of the TC has been impressive and overall planning within the CRSP has improved; however, a major CRSP-wide shortcoming has been a perceived failure to review/adjust projects in the context of prevailing conditions in the countries in which the projects operate. This shortcoming relates to inability of the TC to travel and to limitations on the MO to travel. On-site observations are necessary to try to insure that CRSP activities are highly relevant to priority global and national developmental needs with special regard to beans and cowpeas.

Prospects: Satisfactory.

The outlook indicators are mixed. On one hand, many of the projects seem to be on the threshold of significant achievements; e.g., superior, disease-resistant, highly productive, consumer-acceptable cultivars are thought to be one or two years from general release and similar "breakthroughs" are imminent in other areas of CRSP research. On the other hand, the CRSP has been operating seven, going on eight, years and the EEP can, for example, find no discernable change in the availability of beans and cowpeas.

It is critically important for project PIs and others to exert special efforts to accelerate the adoption and use of CRSP research results because the CRSP is rapidly reaching the point of expected payoffs.

Prospects for the use of advances in molecular biology/biotechnology to overcome/reduce constraints to bean production are exciting and appear to have great potential. The CRSP model offers an especially suitable means to extend the new technology to developing nations.

Overall Rating: Satisfactory.

III. Program Evaluation: Training and Women in Development

A. Training

The need to maintain a balance between training and research in the CRSP has primarily been presented as a competition for funds between research activities and degree training. With various projects taking into account Host Country human and financial resources, as well as opportunities for graduates, concern for an appropriate balance is evident as is concrete action to maintain that balance. This is especially impressive in light of budgetary constraints. However, funding cuts have resulted in a substantial drop in training and, since it is impossible to separate graduate training from the success of research projects in universities, a continued decrease in graduate-level degree training may place research efforts at risk. With the increasing success of CRSP research endeavors and the resultant new technology, it also becomes increasingly important to focus on the balance between research activities and short-term training, with a specific focus on training to share research results. The need for balance in training for the CRSP as a whole and for individual projects, as well as a need to increase the focus on short-term training, requires the development of a planned approach to training.

Degree training in the CRSP has been most impressive numerically. The completion of degree programs by 22 students in 1987, 36 percent of whom were women and 77 percent of whom were HC nationals, are admirable statistics, especially in light of funding cuts. Non-degree short-term training is a cost-effective tool for the development of specific skills, the dissemination of research results and new technology, and networking among scientists.

With data collection on training concentrating almost entirely on quantitative measures, it is impossible to evaluate the appropriateness of training programs. Certainly, participants are well trained in their major scientific fields. However, are degree programs planned for the variation in Host Country educational systems as compared to those in the US (e.g., the complete specialization of B.Sc. programs often to the exclusion of any training in management, technological change or microcomputer technology)? Additionally, are degree programs planned to insure that students are, indeed, well trained for the activities for which they are to be responsible (e.g., management)? In fact, what have been the responsibilities of trainees upon their return home? How has CRSP-funded training coincided with total HC training needs? This stage of the CRSP, with considerable training completed and a request for a project extension pending, is a particularly appropriate time to consider these training issues.

B. Women in Development

The activities of the CRSP Women in Development Program, reorganized external to the core Management Office in 1986, have been limited by reduced funding and personnel allocations. However, the WID Specialist has clearly accomplished several goals during FY 87:

1. She has provided specific project support to the INCAP/Washington State University and Cameroon/Purdue University projects.

2. She has represented WID concerns to the overall CRSP. The challenge of accomplishing the latter with a half-time position is especially difficult; in fact, if the role involves encouragement as well as monitoring, it is impossible. If the CRSP's program goal is to be attained, a concern for WID and small farmers is essential, with that concern being the responsibility of all researchers, not just the WID Specialist. Many of the Bean/Cowpea CRSP's activities that relate to the roles of women in development are a direct result of the inclusion of a WID component in the program (unlike the other CRSPs). Other WID efforts are merely the result of a good, comprehensive approach to the development of technology for farmers and/or a situation of recruiting highly qualified, capable candidates for employment and training.

The CRSP's record of providing training opportunities to women is particularly impressive. Of the 160 degrees completed by September 30, 1985, 32 percent were granted to women. This, of course, represents numbers for the total CRSP. Individual project numbers vary a great deal, with some training less than 32 percent women and some more. In FY 87, of the 22 students completing degree training, 8 were women (36 percent). Ironically, short-term training has had slightly less representation of women at 29 percent through September 30, 1985. Short-term training is usually a particularly acceptable form of training for professional women--in addition to the gender-neutral asset of less disruption to an individual's career, it also causes less disruption to the extensive family responsibilities of most women.

The inclusion of a WID element in the research of the various CRSP projects has not been consistent. Some projects have clearly seen an understanding of WID as essential to success while others are focusing on activities that are deemed gender neutral. Certainly, at certain stages of scientific agricultural research there is minimal concern regarding the ultimate adoption of new technology by the farmer. However, agricultural research ultimately must be linked to production and the producer. Several of the projects have already included farm-based field trials as an integral part of their research and these appear to have at least considered the potential impact of gender-based labor, resource and power allocation. However, several of the projects are just reaching the stage of initiating farm-based field trials. The move to initiate such trials offers researchers the opportunity to: (1) develop a stratified sample of farms to include variation in gender-related areas; (2) disaggregate results according to gender; and (3) determine whether or not gender issues may prove to be the confounding factor in the ultimate adoption of the technology.

As various CRSP projects are beginning to accomplish their basic research goals and are moving toward field research and dissemination of new technology, the necessity of institutionalization of WID components in Host Country research teams becomes more urgent. The institutionalization of WID can be enhanced through linkages with other WID-related activities in Host Countries, especially in the area of adaptive research and through short-term training activities.

IV. Program Evaluation: Project Ratings

A. Bases for Evaluation: Rating Categories/Format

Using guidelines provided by BIFAD and AID, a Scope of Work was prepared which provided for an evaluation of progress, funding, plans and status/-prospects for each CRSP project (Attachment A). These criteria were assessed on the bases of reports submitted by the projects' Principal Investigators, project site visits, data provided by the MO and discussions with MO officials. Each project was given one of the following category designations re rating and recommendations. Following these assessments, a comment was made on the proposed request for extension.

Category	Rating and Recommendation
1	Highly Satisfactory
2	Satisfactory
3	Satisfactory--CRSP officials may wish to consider major adjustments
4	Unsatisfactory--CRSP officials may wish to consider orderly phaseout

B. Summary of Ratings

Category 1: Brazil/University of Wisconsin/Bliss
Brazil/Boyce Thompson Institute/Roberts
Nigeria/University of Georgia/McWatters
Senegal/University of California-Riverside/Hall
Tanzania/Washington State University/Silbernagel

Category 2: Botswana/Colorado State University/de Mooy-Brick
Dominican Republic/University of Nebraska/Coyne
Guatemala/Cornell University/Wallace
Honduras/University of Puerto Rico/Beaver
Mexico/Michigan State University/Adams

Category 3: INCAP/Washington State University/Swanson

Category 4: None

Not Rated: Cameroon/Purdue University/Murdock
Malawi/Michigan State University/Adams

V. Program Evaluation: Fiscal and Administrative

In response to directives from AID and the ME, and by decisions made in the MO following the budget cuts of the last few years, the MO has reduced the number of FTEs in their office considerably. This was done in an effort to minimize the effect of the budget cuts on the research of the CRSP. Besides having a reduced total number of personnel, all those who are working are doing so on a part-time basis. Together the Director and the Deputy Director total 1.75 FTE. The Administrative Assistant and the Secretary each have a 0.9 FTE appointment. In response to some apparent slippages in the MO during the last year, the effect of this cutback in FTEs was one of the primary agenda items in this evaluation.

After careful deliberations and discussions at various levels, it appears that most of the problem can be traced to a now-former secretary who was just not able to do the job that needed to be done to help manage and run a nearly $3,000,000-a-year program. With the reduced staff, accurate communication and follow-through with tasks was required of each person in the office. When the secretary misfiled, misplaced or forgot, the slippage that occurred was inevitable even though procedures in place in the office to avoid it seemed efficient. Changing the secretary was not an easy task within the administrative structure at MSU and has been a major accomplishment of the MO during the year. To all appearances, the problem has been solved and a new secretary is now in place.

On the other hand, all activities that had formerly been carried out in the MO cannot still be accomplished with the reduced office staff even though they often work longer hours than their part-time FTEs would indicate. Travel by the MO to troubleshoot and help solve problems has been curtailed as has the number of publications coming out of the MO.

The annual report of the MO argues that the individual scientists are publishing more as their projects mature and that more of the articles are refereed. This is a trend that would not be unexpected and, indeed, the MO has prepared an impressive bibliography of publications emanating from the CRSP. Without a summary, however, it is difficult to verify the above trend. The question remains as to whether there are certain kinds of publications that the MO, itself, should publish. Examples would include a story on the CRSP as a whole. In general, the MO feels that because the CRSP is a research grant, the emphasis should be on journal articles. However, others interviewed during the review feel that there are some areas where the MO is the most appropriate entity to publish. No attempt to decide this issue is made here. Rather it is suggested that the MO, the TC and/or the BOD consider it.

In a previous annual report, the EEP suggested that the TC should travel more in order to be more effective in its evaluation of projects. The MO argues that while this is obviously worthwhile, it is difficult for the members of the TC to justify more travel in their already busy schedules. This is verified by the surplus in the TC budget for the last year. Three examples serve to illustrate reasons for MO travel. The Mexico project shows only a small portion of their

funds have been spent. The reason is because the HC institution is not reporting their expenses and the University of Minnesota is slow to do so. A trip by the MO may have been an efficient means of improving the situation. Second, the EEP review in Tanzania which had been scheduled for several months was cancelled at the last minute because of a request by the HC PI that it be delayed. This may well have indicated a need for a trip by the MO. The review was subsequently carried out successfully with MO participation. Third, buy-ins may be an important source of funds for the CRSP in the future. The negotiation of buy-ins will undoubtedly require the MO to travel to HCs and probably to US institutions as well. Fourth, one of the responsibilities of the MO is to monitor research activity. A Deputy Director from the biological sciences was hired, in part, to provide the expertise necessary to carry out this responsibility. It is difficult to understand how this person can monitor agricultural research activity without periodic visits to the field, particularly in the absence of such travel by the TC. Under these circumstances, the MO and BOD may wish to consider augmenting travel funds for the MO.

The MO is proposing an additional modification in the FTE arrangement of the office. They propose a shift of 0.1 FTE from the Deputy Director to the Administrative Assistant. In this way, the Administrative Assistant would be full time (a move clearly worthy of support) and the Deputy Director would be able to dedicate more time to the research activities upon which he is judged for promotion in his home department (also worthy of consideration). The MO would like a net addition of 0.1 FTE to make the Secretary also a full-time position. This seems reasonable except that the new Secretary is pleased with a 0.9 FTE position which allows her to have Friday afternoon free. She indicates that, as she is learning the new position, it is really a full-time job. She feels, however, that when she gets it organized, she should be able to do it on a 0.9 FTE basis.

In general, the EEP supports the request for changes in FTE arrangement and the addition of at least 0.1 FTE. However, if the Deputy Director reduces his time on the CRSP even further, it would surely necessitate an offsetting increase in travel by the TC.

The training component is well organized and computerized in the MO. In consonance with decreased funding, the training program has also been cut. Most heavily cut was short-term training and networking, but there has also been a cut in M.S. and Ph.D. candidates. The MO argues that much of the latter is proportional to the reduction in the number of institutions participating in the CRSP, and this seems reasonable. However, the MO anticipates some decline over time even without a drop in number of institutions. This implies that many of the persons who have been trained are staying on in their home institutions. This would be an interesting and important fact to substantiate because it is contrary to what was recently found in the Dominican Republic.

Fiscal management in the MO appears to be well in hand notwithstanding the problems associated with the overlapping of reporting dates and the use of different systems in the collaborating institutions. The MO has recently begun suggesting monthly (as opposed to quarterly) reporting. Because this has not been instituted as a requirement, not all collaborators are complying; but it does appear to facilitate fiscal management and hopefully will become CRSP-wide

in the near future. Some travel by the Administrative Assistant, however, may be required to facilitate the change. The legal and accounting requirements and financial reporting carried out by the Contract and Grant Officer appear to be impeccable.

Staff in the MO are a well-organized team and all are enthusiastic in their work. They are to be commended for being able to conduct the affairs of a large and complex CRSP with a minimum staff and a meager use of project funds. This undoubtedly reflects the professional capacity and training of the Director. Nevertheless, the BOD and the ME may wish to consider augmenting the number of FTEs in the office slightly to make it more efficient and allow more time for forward planning. The MO may decide to carry out some studies such as the nature of publications coming from the CRSP and whether people trained by the CRSP are staying with their home institutions. Either the TC should be increasing their travel or travel funds shifted from their budget to the MO budget so that needed travel can be done by that office.

The publications of the projects and of the MO may include formal professional publications in refereed journals; workshop, conference and seminar proceedings; and more or less internal publications to promote the flow of information within the CRSP and to AID. As a project advances, other publications may also be intended to transmit useful information on results and methods to potential users. The EEP suggests that the TC should review the publication record of the CRSP to determine the extent to which the publications are appropriate to the prospective audiences and users.

1987 EXTERNAL EVALUATION PANEL SCOPE OF WORK

I. PROGRESS

A. Specific research contributions (to date and in early prospect) toward amelioration of national (HC and US) and global constraints. Cite constraint and specific contribution, with special regard to the following:

1. Research in process in Host Country and in US

2. Research results disseminated and in use in Host Country and US. Give examples such as:

   a. Improved cultivars; inoculants; tests; methods; systems; and technical papers, reports and bulletins produced and released for public use

   b. Evidence of extent of use

3. Other research-related results, such as:

   a. Germplasm conservation and use

      (1) Accessions collected/acquired/in storage and kinds and amounts distributed domestically

      (2) International exchange

   b. Seed production (or other materials) and distribution of CRSP-produced cultivars (or materials)

   c. Impact of other CRSP-produced or -recommended technology, including production inputs such as fertilizers, inoculants, insecticides, equipment and machines

   d. Contributions to and participation in international bean/cowpea research networks, e.g., IARCs and other

   e. How the research findings specifically address the needs of small-scale farmers and women

B. Changes in national production of beans and cowpeas in Host Country

1. Hectares planted

2. Yields per hectare

3. Total production

C. Training (only CRSP-sponsored funded in 1987)

1. Numbers and kinds in process in US, HC and elsewhere

2. Numbers and kinds completed--US and HC

3. Cumulative training totals--thru 1987

4. Project training targets during three-year extension period (1986-89)

D. Institutional development, i.e. strengthening Host Country bean and/or cowpea research and improvement systems

1. Cite changes in 1987

2. Over life of project (where are we?)

3. In prospect (where are we going and how long to get there?)

II. FUNDING/FISCAL MANAGEMENT

A. Audit/project management reviews

1. Date, by whom, and findings and follow-up

2. If no audit, has one been requested?

B. Adequacy of funding (to accomplish objectives) by CRSP participants

1. AID

2. Host Country--comments/actions

3. US university--comments/actions

C. Problems regarding funding, budgeting, release of funds, procurement and other--in US and Host Country

D. Adequacy of current policies and procedures (especially regarding follow-up on use of funds and commodities)

III. PLANNING

A. Work plan for 1987

1. TC and/or ME guidance/approach, if any

2. How prepared?

3. Who prepared?

4. When prepared?

5. Budget and work plan related?

B. Review of 1987 work plan during implementation

1. Adjustments/changes/additions/deletions--ME notified? TC?

2. 1987 work plan--accomplishments and shortfalls

C. Plans for 1988

1. Research in Host Country and US

2. Expected changes/additions/deletions from 1987 regarding funding, personnel, research activities, commodities or other and their reasons (i.e. availability of funds; failures; marginal activities; inadequate performance; unrealistic plans)

IV. STATUS

A. Appropriateness of activities to goals of Global Plan

B. Balance between research and training

C. Balance of domestic vs overseas activities with respect to program constraints

D. Level of collaboration/cooperation between US and Host Country institutions and personnel

E. Relative contributions of collaborating institutions and individuals towards accomplishment of objectives

F. Interest, involvement and support of USAID Mission and/or US Embassy

G. Domestic and international linkages and cooperation/collaboration

H. Cost effectiveness, especially regarding level of activity vs. funding

I. Institutionalization of Host Country component--evidence of

V. PUBLICATIONS

VI. OVERALL RATING

VII. COMMENTS ON THE EXTENSION PROPOSAL

1987 EEP REVIEW

BOTSWANA/COLORADO STATE UNIVERSITY/Brick (de Mooy)

Development of Integrated Cowpea Production Systems in Semiarid Botswana

I. PROGRESS

This was the last year of full funding for this project.

A. Specific Research Contributions

1. Research in process

a. Botswana

In Botswana, the project has addressed two of the global constraints which are important locally--limitations of the physical environment and limitations due to pests and diseases. The environments in which cowpeas are grown in Botswana are semiarid, seasonal and unpredictable. In 1987, the work on environmental constraints consisted of trials of considerable numbers of entries at up to three locations, with limited phenological observations, few or no environmental observations, and some observations on disease incidence. The voluminous data are presented but not analyzed or explained in environmental or elementary eco-physiological terms. However, three entries, ER7 and Rogonawa (TVx 3236-01G) (both of which came from IITA) and Morogonawa (a Botswana collection B 005-C), have been released for multiplication, testing and some extension. Surveys suggest that ER7 is popular with at least some farmers.

Many of the trials in 1987 failed because they were in unsuitable locations or were eaten by wild animals. A soil water probe was used to identify times in the season when water was short, but little or no use was made of the results except perhaps as part of an M.S. thesis at CSU.

Lines which may be resistant or immune to at least one strain of the cowpea aphid-borne mosaic virus were found.

The breeding program started at the request of the HC is at far too early a stage to have reached any useful conclusions--segregation was still evident in F_6. Perhaps this reinforces the view that breeding should be undertaken only where there is real certainty that it can be continued for a sufficient number of generations to deliver useful products.

Work on varietal "blends"--two components only, as in the work in Senegal rather than the more complex blends used by

bean growers in Malawi--provided useful training for the HC PI, Ms. Manthe, but in the nature of things it could not lead to firm conclusions or recommendations.

Earlier studies in Botswana have led to a Ph.D. thesis at CSU on sorghum-cowpea intercropping which suggested that a short-season cowpea sown with the sorghum can constitute a useful mixture. Some farmers in Botswana may already be growing such crops in this way.

Work on minimal tillage (far from a new topic in Botswana) does not appear to have reached any conclusions which are either new or applicable in the local circumstances.

It is regrettable that the project has not given any systematic account of cowpeas (apart from the genetic resources collections) or of methods of cowpea growing in Botswana. Maybe farmers there already use mixtures?

b. United States

No research was done at CSU except by graduate students whose field work had been done in Botswana. Work in which the US resident investigator participated developed a glasshouse method to screen seedling plants for resistance to Macrophomina phaseolina and Aphis craccivora. No account seems to have been taken of the work at the Boyce Thompson Institute, for which the CRSP paid, on the latter topic.

2. Research results disseminated and in use

a. Improved cultivars, inoculants, tests, methods, etc.

The only outputs which are at all likely to be durable are the three early types of cowpeas mentioned above, which may be useful as sole crops or in mixtures.

b. Evidence of extent of use

Eighty-six farmers in three regions were questioned about the usefulness of ER7, of which they had earlier received seed. Seventy-eight of them accepted it because it matures early and has upright habit and palatable seed. Forty-four of the farmers were interested in selling the seed, and fifty said they intended to multiply it.

3. Other research-related results

a. Eight hundred fifty-two accessions of cowpea have been collected in Botswana. Of them, about 390 have been grown out and described using descriptors similar to those used by

IITA. The collection has been handed over to the Botswana Ministry of Agriculture. It is not at all certain that the seed can be rejuvenated or conserved in Botswana. Nor is it evident that a duplicate set has been deposited at IITA or with the International Board for Plant Genetic Resources.

b. Eight tons of ER7 were produced by the seed multiplication unit of the Department of Agricultural Research and "approximately 100 to 180 kg" of seed of the other two varieties, Rogonawa (TVx 3236-01G) and Morogonawa (a local form listed as B 005-C), were available. ER7 was enthusiastically promoted by the Ministry's extension officers and was found to be popular in a survey of 86 farmers (which is being extended).

c. A thresher was designed and a prototype was built, but the work had not gone further when the project was ended. A ridger-planter seems to have had a similar fate. Work on minimal tillage had not reached a usable stage.

d. There was collaboration with IITA in a series of rather unsuccessful evaluation trials, and visits were exchanged with the IITA representative in Harare, Dr. Naik.

e. Most producers of cowpeas in Botswana are small-scale operators.

B. Changes in National Production of Beans and Cowpeas in Host Country

Data estimated for total pulses in FAO Production and Trade Yearbooks, 1981 and 1986. Data and experience suggest that virtually all of the figures relate to cowpeas. Population data from successive Production Yearbooks, derived initially from UN sources.

		1979-81	1984	1985	1986
1.	1,000 hectares harvested	30	30	30	30
2.	Yields, kg per hectare	622	433	467	467
3.	Total production, 1,000 tons	19	13	14	14
4.	Net imports, 1,000 tons	16	4	6	5
5.	Total supply, 1,000 tons	35	17	20	19
6.	Population, 1,000	915	1,042	1,107	1,149
7.	Supply per head, g/day	10.5	4.5	4.9	4.5
8.	Equivalent protein/head/day at 25%, g	2.6	1.1	1.2	1.1
9.	Total protein supply, g/head/day	68.7	67.5 (average 1983-5)		
10.	Plant protein supply, g/head/day	45.9	46.7 (average 1983-5)		
11.	Cowpea protein % total protein	4	2		
12.	Cowpea protein % plant protein	6	2		

One might ask what priority these data suggest for research on cowpeas in Botswana, particularly as the country appears to have an adequate protein supply, of which about one-third comes from animal sources, and is now mineral-rich and has climatically better-favored neighbors.

C. Training

1. Numbers and kinds in process

None

2. Numbers and kinds completed

Ms. Mmasera Manthe wrote a thesis on mixtures of lines of cowpea and completed an M.S. at CSU; she returned to Botswana in 1987 to become HC PI.

Mr. Peter Montshiwa completed an M.S. at CSU with a thesis on tillage practices and returned to Botswana, where he was transferred to the extension branch of the Ministry of Agriculture.

Ms. Karen L. Conniff completed a Ph.D. degree at CSU on intercrop systems with cowpea and sorghum.

The field work for all these theses had been done in Botswana.

3. Cumulative training totals

2 M.S. (nationals of Botswana)
1 Ph.D. (US national)

4. Project training targets during three-year extension period (1986-89)

None

D. Institutional Development

1. Changes in 1987

Ms. Manthe returned from training and became HC PI. It cannot be assumed that she will continue to work on cowpeas after the end of the project.

2. Over life of project

As above

3. In prospect

None

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

None conducted nor requested.

B. Adequacy of Funding

1. AID--Funding was not regarded by the US researcher stationed in Botswana as adequate in recent years to achieve his objectives; but it seems to have been sufficient to permit a more or less orderly withdrawal (apart from doubts about the future of the germplasm collection).

2. Host Country--Contributions in the salaries of individuals, the time of Peace Corps volunteers accredited to Botswana and the resources of experiment stations and sites.

3. US university--CSU's contributions appear to have consisted of the support of the US resident investigator, the provision of facilities and academic support for trainees from Botswana and maybe some logistic and financial support for the work done at Riverside.

C. Problems

The decreases in funding as the project changed and its end drew near created difficulties for the resident investigator, who felt that his work had been undermined.

D. Adequacy of Current Policies and Procedures

Satisfactory to ensure orderly closure

III. PLANNING

A. Work Plan for 1987

The project was phased down during the year, recognizing that many elements would be incomplete. There is no information given regarding how the work plan was prepared or when, nor whether the budget and work plan are related.

B. Review of 1987 Work Plan During Implementation

1. Adjustments/changes/additions/deletions: None

2. Accomplishments and shortfalls: Volume 3 of the germplasm catalogue was published and Volume 4 is said to have been prepared for publication. Methods of screening cowpeas for resistance to or tolerance of Macrophomina phaseolina and to aphids were developed and applied to 150 cowpea accessions from Botswana at the University of California-Riverside.

C. Plans for 1988

The project is moving to its close.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

The topics chosen for study were appropriate to the goals in respect to environmental constraints and constraints due to diseases and insects, particularly ashy stem blight (Macrophomina phaseolina) and cowpea aphid-borne mosaic virus. However, the work was not based on studies of the environments in which cowpeas are grown in Botswana or of the methods and difficulties of cowpea growers there. Hence the choice of activities, while appropriate to the Global Plan and customary in experiment station research, may not all have been appropriate to Botswana.

B. Balance between Research and Training

Satisfactory

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

Satisfactory, in that apart from the last round of screening for disease and aphid resistance/tolerance at UCR and the course work and writing of theses, everything that was done was done in Botswana.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

None of the reports on this project relate its purposes or operations to the long history of research on dryland farming systems in that country or on cowpeas in neighboring South Africa or Zimbabwe. The US Principal Investigator and his research associates appear to have worked single-mindedly to do as much as they could by themselves, which is praiseworthy but did not build the work into the preceding and continuing structure of agricultural research in Botswana. Nor have we had any systematic account of the role of cowpeas in agriculture in Botswana or the methods by which the crop is produced and handled after harvest. Yet much must be known of these matters by Botswana nationals and from the earlier and concurrent research of others.

As between the US Principal Investigator and the Host Country staff and institutions, good, even though it is not clear that all work funded by the CRSP was perceived as important by the Botswana Ministry of Agriculture. For example, the work on tillage was terminated by the Botswana Government in 1987. In part, this work repeated research done earlier in great detail for several years in Botswana but apparently generated different conclusions.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

The Botswana Ministry of Agriculture seems to have done all it undertook to do in relation to this project.

CSU does not have a cowpea research program and so contributed only the support of the US Principal Investigator and his research associate (without whom nothing that was done could have been done) and the parts of the training that were done at CSU.

UCR evidently cooperated well in the screening studies referred to above.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

The USAID Mission in Botswana is reported to have been interested in the project. The report also refers to several visits to the field and interest shown by the present director of USAID, Mr. John Hummon.

G. Domestic and International Linkages and Cooperation/Collaboration

Cooperation with UCR and with IITA have already been mentioned; the latter was the source of two out of three successful lines released by the project.

No link is reported with IBPGR; and the reports contain no assurance that the cowpeas collected in Botswana will be securely conserved or made available internationally. However, the material may be expected to be of considerable interest to other semiarid regions, including the lines reported to be resistant to at least one strain of cowpea aphid-borne mosaic virus. A complete set of this Botswana collection may have been shared with the Senegal project, which intends to multiply its material if funds permit and send samples to the Regional Plant Introduction Station of USDA at Experiment, Georgia.

H. Cost Effectiveness

The project seems to have been relatively inexpensive since, in the scientist couple, the CRSP appears to have gotten two expatriate workers for the price of one, and two Peace Corps volunteers were associated with the work. Two Botswana nationals were trained and three "varieties" were released. However, it is very likely that within a few years the project will have sunk without trace.

I. Institutionalization of Host Country Component

The agricultural knowledge system in Botswana is not yet strong, and so there has not been an effective HC institution to institutionalize into. The CRSP has always found it difficult to know how to approach such situations, which are common in Africa. The first HC PI was an

expatriate; the second will not necessarily remain in cowpea research. It is not clear that cowpeas rank high on the list of GOB's agricultural development priorities.

V. PUBLICATIONS

One Ph.D. thesis; two M.S. theses; one bulletin of Botswana Ministry of Agriculture; the three volumes (and perhaps a fourth to come) of the cowpea germplasm catalog; four presentations at meetings in Botswana. No publications in refereed journals.

VI. OVERALL RATING: 2--Satisfactory, orderly termination

VII. COMMENTS ON THE EXTENSION PROPOSAL

Not applicable

1987 EEP REVIEW

BRAZIL/UNIVERSITY OF WISCONSIN/BLISS

Identification of Superior Bean-Rhizobia Combinations for Utilization in Cropping Systems Suitable to Small Farms in Brazil

AI. IMPROVING NITROGEN FIXATION (Bliss)

I. PROGRESS

A. Specific Research Contributions

1. Research in process

a. Improving the host plant through breeding and selection and optimization of N_2-fixation in prevailing cropping systems.

b. Institutionalizing the concept of selection for enhanced N_2-fixation as a goal for national programs.

2. Research results disseminated and in use

a. Five breeding lines of black beans: WBR no's. 22-3, 22-8, 22-34, 22-50 and 22-55 registered as germplasm for international release; some of these may be released in Brazil as improved varieties (e.g., WBR 22-50 in Minas Gerais; 22-8 in Rio de Janeiro; 22-8 in overall performance).

b. Rhizobial inoculant strains provided for studies at CNPAF, CRSP/Malawi/MSU and USAID/Mexico BNF Limiting Factors Project.

c. Activation of and participation in Brazilian networks for evaluating both new bean cultivars and rhizobial strains.

d. Dissemination of research results through participation in meetings, workshops and visitations where project results are presented; also, through scientific and technical papers.

e. Germplasm collected and distributed for BNF studies at CNPAF, UWI (US PI) and MSU; includes both plant materials and rhizobia.

f. On-farm research carried out on snap beans in Wisconsin by Bliss and colleagues.

g. Small farmers (including women) expected to benefit most from high N_2-fixing varieties being developed.

3. Other research-related results

   a. Research achievements in FY 87 (3 thrusts; 8 experiments)

      (1) Development of superior black bean breeding lines: WBR22-3, WBR22-8, WBR22-34, WBR22-50 and WBR22-55; carioca lines: A241, A246, A255 and A285 (all CIAT lines); and mulatinho lines: A353, A357 and BAT160 (CIAT lines) for N_2 fixing ability in trials throughout Brazil (based on total shoot N [R7], seed yield and seed N).

      (2) Identification of superior nodulating lines like UW21-58 for trapping native rhizobia.

      (3) Development of simplified criteria for estimating N_2-fixation, such as total plant N and seed N in breeding studies rather than more complicated and costly studies.

      (4) Demonstrated possibilities for improving N_2-fixation by intercrossing high N_2-fixing lines, and feasibility of selection for more efficient N-fixation of low phosphorus soils.

      (5) Development of research techniques for evaluating nodulation efficiency using low numbers of rhizobia; initiation of studies to develop high N_2-fixing bean lines that also respond to N fertilizers.

   b. Research results being analyzed/evaluated

      (1) Verification trials of superior bean varieties and inoculum sources (including: CNPAF150, CIAT899, Viking 1, ITC-53)

      (2) N_2-fixation under low P stresses

      (3) Effects of cropping systems x rhizobial strain interactions in pure culture and relay cropping with maize

      (4) Optimizing systems for N_2-fixation with applied N

B. Changes in National Production of Beans and Cowpeas in Host Country

   Changes resulting directly from the project not expected for several years.

C. Training

   1. Dr. Pedro Pereira completed Ph.D. studies at Wisconsin in July 1987.

2. Mr. Ricardo Araujo to commence graduate training in early 1988.

3. Ms. Susan Nchimbi (WSU/Tanzania) trained at UWI--will complete Ph.D. in early 1988.

4. Two Brazilian B.Sc.'s have been trained through their work with the project.

5. Additional training needs: A physiologist/agronomist needed to form a critical mass for the project at CNPAF.

D. Institutional Development

1. Dr. P. Pereira's return (July 1987) has greatly accelerated institutionalization of breeding for BNF--a concept strongly supported by decision makers.

2. Establishment of cross-networking: promising bean cultivars from other research evaluated by the project, and high N_2-fixers being tested in national varietal trials.

3. This project has made a significant contribution to CNPAF institution building.

E. Progress in Relation to Log Frame

Progress achieved to date appears to conform to the log frame objectives.

F. Collaboration

Generally satisfactory--but collaboration with other CRSP projects could be improved; although linkages with WSU/Tanzania, MSU/Malawi and with CIAT (through CNPAF) have been good. Included Ph.D. training of Ms. Susan Nchimbi from Tanzania.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

1. Merging of Bliss and Maxwell projects at UWI has worked well.

2. UWI responsible for expenditures--audited regularly by university audit procedures.

B. Adequacy of Funding

Generally adequate by parties concerned although rapid inflation in Brazil sometimes caused unique problems--e.g., late submission of expenses, staff increments, other.

C. Problems

1. Delay in submitting expenses due to rapid devaluation

2. Lack of transport (pickup truck) owing to bureaucracy

3. Delay in clearing imported equipment/supplies through Customs in HC

D. Adequacy of Current Policies and Procedures

Current policies and procedures are working well but require more expeditious approval of international travel.

III. PLANNING

A. Work Plan for 1987

Commensurate with 1986 review projection

B. Review of 1987 Work Plan During Implementation

Not reviewed during implementation

C. Plans for 1988

1. Emphasis on applied BNF

Particular emphasis will be given to enhancing BNF in improved bean varieties through utilizing elite parental stocks, superior rhizobial strains and appropriate cultural practices.

2. Impact of training

a. Return of P. Pereira will focus greater attention on breeding for BNF enhancement at both project and national levels.

b. Departure of R. S. Araujo for graduate training will necessitate replacement person by CNPAF--particularly when Bob Henson also leaves in September 1988.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

The project is unique and critical in the overall CRSP Global Plan in that it is the only one predominantly directed to increasing bean yields through enhanced BNF. In this sense, it is particularly focused on small farmers and the disadvantaged without resources or access to purchased inputs nor the means to afford expensive protein dietary supplements.

B. Balance between Research and Training

Greater emphasis to date has been given to research to demonstrate possibilities for enhancing BNF in beans since there had been an insufficient knowledge base.

C. Balance between Domestic vs Overseas Activities with Respect to Program Constraints

The balance appears appropriate at this juncture. Most of the site-specific trials and experiments are conducted in Brazil, while the more fundamental and exploratory research has been done in the US. Concurrently, the latter research is being moved to Brazil as scientists are trained and facilities become available.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Collaboration among US and HC scientists has been excellent. CNPAF has also cooperated wholeheartedly in providing highly satisfactory and timely fiscal reports.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

Satisfactory and appropriate to expectation outlined in the work plan and log frame.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

The project keeps USAID informed of plans, activities and accomplishments; but the USAID presence is minimal with limited personnel.

G. Domestic and International Linkages and Cooperation/Collaboration

The UWI PI and MSU Co-PI (Bliss and Dazzo) are also PIs on the CSRS/AID BNF Special Grants with Honduras and Mexico. The CNPAF also has a project with the IAEA (Vienna) at CENA in Piracicaba on BNF in beans that works closely with this CRSP. Germplasm of beans and rhizobium are shared widely on a global scale.

H. Cost Effectiveness

Rated as excellent owing to active contributions of participating institutions, allied projects with non-CRSP support, and growing enthusiasm for BNF enhancement. Expansion of networking has multiplied basic project support.

I. Institutionalization of Host Country Component

1. The HC researchers, Araujo and Pereira, are CNPAF permanent staff. However, CNPAF is urged to assign a physiologist/

agronomist to the project and co-opt the support personnel currently carried by the CRSP project after its termination.

2. Breeding for enhanced BNF is being continued by CNPAF as part of the overall breeding goals; and promising bean lines from this project are included in national varietal trials.

V. PUBLICATIONS

Satisfactory: fourteen publications and presentations, with HC scientists senior authors of eight papers

VI. OVERALL RATING: 1--Highly Satisfactory

Work on BNF is outstanding--has excellent balance in most areas

VII. COMMENTS ON THE EXTENSION PROPOSAL

The EEP recommends approval of the extension proposal.

BI. DISEASE RESISTANCE (Maxwell)

I. PROGRESS

A. Specific Research Contributions

Development of a sequential inoculation procedure for four pathogens: angular leaf spot, common bacterial blight, rust, anthracnose

Evaluation of 4500 germplasms for resistance to bean golden mosaic virus (BGMV)

Development of a DNA probe for detection of Xanthomonas campestris pv. phaseoli needed to follow the survival of bacterial blight in bean debris.

Characterization of BGMV DNA: consists of two distinct DNAs (circular w/2.6-2.9 kilobases) with homologies of between 65 percent and 85 percent (separate viruses)

Twelve BGMV resistant breeding lines identified and released

1. Research in process

a. Bean Golden Mosaic Virus

(1) Further characterization of the BGMV virus--staining for nucleolar inclusion (gemini type)

(2) Attempts at transmission of BGMV--mechanical not possible. Must use white fly (Benisia spp.)

(3) Identification of BGMV resistance--especially in light-colored seed types

(4) Search for a full-length clone of DNA-2 of BGMV-BZ and total sequencing of DNA-1 and DNA-2

(5) Study infectivity of DNA clones as probes to detect the virus in several hosts

b. Anthracnose (Colletotrichum lindemuthianum)

(1) Variability in races--host plant resistance is race specific; hence the need to identify race specific resistance genes.

(2) Variability of pathogen races from different regions studied using isozyme patterns.

c. Common bacterial blight (X. campestris pv. phaseoli)

(1) Evaluation of dry leaf inoculum for assessing host plant reaction--found efficacious as aqueous cell suspension.

(2) Overwintering survival of the pathogen: viability declined with time; leaves are best source; plowing reduces viability compared with no-till.

(3) Variability of the pathogen and molecular epidemiology: molecular hybridization served to identify "races" of Xanthomonads; non-pathogenic Xanthomonads lack the plasmid and different restriction fragment length polymorphisms (RFLPs) found in Xcp.

2. Research results disseminated and in use

a. Multiple disease resistance (MDR)

(1) Both CNPAF and IAPAR/Londrina use a modification of the procedure with pathogens of rust and bacterial blight in May-June plantings; and for anthracnose and angular leaf spot in November plantings.

(2) Resistance for BGMV is done in the greenhouse using white flies.

(3) Sand blast transmission of Xcp found useful.

(4) Bacterial blight found to be a single race simplifying breeding.

b. Dry inoculum for evaluating anthracnose and angular leaf spot; prepared from dried leaves of greenhouse inoculated plants and cornmeal/V-8 juice agar cultures.

c. Three identified races of anthracnose (BI, delta, kappa) and specific resistance genes identified to guide resistance breeding activities: two bean collections from Minas Gerais found resistant to all three races of anthracnose.

d. Detached leaf assay for determining MDR: shows similar results for anthracnose and Xcp, but rust development was less on detached trifoliates.

3. Other research-related results

a. Germplasm conservation and use

(1) Domestic

(a) Over 90 accessions with partial resistance to anthracnose stored at CNPAF germplasm bank.

(b) Two bean lines resistant to all three anthracnose races

(c) Since 1980 CNPAF acquired and screened 4532 accessions of Ph. vulgaris and 39 other Phaseolus spp. for BGMV.

(2) International exchange

(a) BGMV resistant lines exchanged with CIAT.

(b) Partially resistant anthracnose lines sent to Imperial College, London for basic studies of disease resistance.

b. How research findings address the needs of small farmers and women

(1) Information on disease epidemiology and host plant response to infection are essential to improve and stabilize production thereby benefitting mainly the small farmers and other disadvantaged people.

(2) Training component has been focused on women both in the US and HC.

B. Changes in National Production of Beans and Cowpeas in Host Country

This is not an objective of the project, but it is supportive of other closely related activities with this goal.

C. Training

1. Short course on MDR conducted for 15 persons

2. Intern training (trainees with undergraduate degrees): 3 persons including 1 woman (HC supported)

3. Master's degree: Ms. Glaucia de Figueiredo, Mr. Paulo E. Melo and Mr. Elber S. Morgado (HC supported)

4. Mr. A. Sartorato received special training in the US in 1982 and 1985 (1 month each)

5. US trainees--PD Fellows:

   a. Dr. Debbie Inglis: production of dry inoculum

   b. Dr. Michael J. Havey: detached leaf assay

   c. Dr. Robert L. Gilbertson: BB and BGMV

D. Institutional Development

1. Changes in 1987

   a. Professor D. J. Hagedorn retired in June 1987; and Drs. Sally A. Leong and Paul G. Ahlquist joined as molecular biologist and molecular virologist, respectively

   b. Brazilian scientists:

      (1) Dr. Josias C. Faria, UWI '83: joined in 1983

      (2) Dr. Carlos A. Rava, completed Ph.D at UFV (Brazil) in 1985

      (3) Mr. Aloisio Sartorato: commenced Ph. D. at USP (Brazil) in 1986

      (4) Dr. Jose E. Cardoso, Ph.D., NCSU '87: joined in 1987

2. In prospect

   a. Institutionalization of MDR methodology

   b. Verify differences between BGMV strains

   c. Training of Brazilian scientists (by the HC):

      (1) Dr. Faria to spend a year at Wisconsin on BGMV

      (2) Ms. Figueiredo to finish her degree

      (3) Two other Brazilian scientists to be trained at UWI

E. Collaboration with Other Projects, Linkages with Other International Research Projects

1. Collaboration with bacteriologists at Nebraska on Xanthomonas; with virologists at Florida on BGMV; USDA scientists on bean rust; Silbernagel (WSU) on germplasm and dry inoculum

2. Major collaboration on BGMV-DNA between CNPAF, CIAT and UWI scientists

3. In HC, collaboration on BGMV between CNPAF/UWI and states of Minas Gerais and Parana; and on anthracnose (training) with the Universidade Federal de Vicosa (UFV)

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

1. Audit on June 17-25, 1987 by EMBRAPA auditors found all aspects satisfactory.

2. Project was reviewed by Dr. Pinchinat (IICA) on December 8-11, 1986.

B. Adequacy of Funding

1. Budget reductions forced layoff of some staff.

2. Training of graduate student (on BGMV) curtailed.

3. Other support for equipment sought as CRSP funding is short.

C. Problems

1. Slow release of funds to Brazil from UWI caused some difficulty.

2. UWI operations worked smoothly.

D. Adequacy of Current Policies and Procedures

No comment

III. PLANNING

A. Work Plan for 1987

Not reviewed

B. Review of 1987 Work Plan During Implementation

Not reviewed

C. Plans for 1988

1. Specific Changes

a. No major changes as project closes on 9/30/88.

b. Dr. Zimmermann to assume acting PI for HC while Dr. Faria is at UWI in 1988.

2. Major Research Objectives

a. Verify differences between BGMV strains by sequencing DNA's; developing DNA probes.

b. Preparation of reports and papers on results.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

1. Project addresses major goal to support the improvement of beans through controlling diseases of beans, an important commodity for the poorest consumers and small farmers.

2. Major research contributions

a. Developing MDR techniques

b. Pathogenic variability of six bean diseases has been determined.

c. Major thrust on BGMV in characterizing its epidemiology, pathogenicity and DNA structure

d. Screening for germplasm (4500 entries) for infectivity to BGMV

B. Balance between Research and Training

Limitation of funding has deterred advanced degree training in the US; but a training course was given for 15 scientists in Brazil; technicians were trained; 3 US post-doctorals were trained; and the HC PI will receive a year of training on virology at UWI in 1988.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

About satisfactory until the present year when most research activities on BGMV-DNA will be carried out at Wisconsin.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Generally, at a high level especially between UWI and CNPAF; also with IAPAR and EPAMIG (Parana and Minas Gerais) and with Rio Verde, Goias. CIAT scientists have also participated in the project, especially in applying materials and germplasm, planning and training.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

No comment

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

The project had limited contact with the US Embassy and AID in 1983, 1984 and 1985.

G. Domestic and International Linkages and Cooperation/Collaboration

Primary US linkages with universities of Florida and Nebraska; Brazil: with the Universidade Federal de Vicosa, IAPAR and EPAMIG. Primary international linkage with CIAT (Dr. Francisco Morales).

H. Cost Effectiveness

Generally cost effective except for international travel and expensive molecular biology procedures. The latter are partially provided from other sources. An additional $5,000 for Dr. Faria's one year's training at UWI would be helpful.

I. Institutionalization of Host Country Component

1. Substantial progress made, especially in the sequential inoculation of bean breeding populations (two pathogens per season--June and November).

2. Testing for BGMV reaction done routinely.

3. Formal projects received "national" codes:

   a. Techniques for Development of MDR in Ph. vulgaris: 002/86/035/1

   b. Varietal Resistance to BGMV: 002/86/019/5

   c. Common Bacterial Blight: 002/84/056/9

   d. Bean Rust: 002/84/055/1

e. Bean Angular Leaf Spot: 002/84/057/7

f. Bean Anthracnose: 002/84/060/1

V. PUBLICATIONS

Satisfactory: two articles in press; eleven articles submitted, six articles have HC senior authors

VI. OVERALL RATING: 2--Satisfactory

The EEP believes the project has largely accomplished its stated goal in developing disease resistance (MDR) bean breeding and can be phased out at the end of the present grant period. However, there remains the unfinished molelcular biology studies on BGMV, a singularly complex pathogen. Therefore, the EEP concurs with the recommendation of the TC in completing the DNA characterization and developing of DNA probes--within a reasonable period of time--and preferably in collaboration with another CRSP project, like the DR/University of Nebraska.

VII. COMMENTS ON THE EXTENSION PROPOSAL

The EEP recommends approval of the extension proposal.

1987 EEP REVIEW

BRAZIL/BOYCE THOMPSON INSTITUTE/Roberts

Insect Pathogens in Cowpea Pest Management Systems for Developing Nations

I. PROGRESS

A. Specific Research Contributions

1. Research in process

a. Brazil

(1) Germplasm collection and storage: 22 isolates of entomopathogenic fungi acquired.

(2) Screening of entomopathogenic fungal isolates: more than 100 isolates screened against major cowpea pests--cowpea curculio, chrysomelid beetles, Empoasca leafhopper (isolates include Beauvaria, Metarhizium, Erynia spp.).

(3) Control of Chalcodermus bimaculatus (cowpea curculio): adults resistant but larvae are susceptible to Beauvaria and Metarhizium conidia up to 100 percent mortality. Soil application of conidia 91 percent and 83 percent effective. Best: M. anisopliae E6 at low rates.

(4) Chrysomelid beetle control (Ceratoma and Diabrotica spp.): best is B. bassiana CP5 applied as foliage spray. Developed innovation using mild cucurbit tuber ("taiuia") as bait and treated with pathogens or synthetic insecticides. New form of Bacillus thuringiensis may also be effective.

(5) Integrated pest management strategy for chrysomelid and curculionid beetle control: B. bassiana CP5 highly effective against both pests. Method involves use of insecticide-treated bait tubers of "taiuia" followed by B. bassiana and/or Metarhizium soil applications at appropriate times. B. thuringiensis may also be used.

(6) Control of Empoasca leafhoppers with Erynia radicans. E. radicans found highly effective under favorable conditions; e.g. some humidity. The fungus is readily produced and applied either as a spray or dried mycelium (most successful).

(7) Mass production of Beauvaria and Metarhizium for microbial control applications: rice culture proved highly successful but may be too costly for small farmers. Alternative substrates are being studied.

(8) Socio-economic studies: exploration of the importance and cultural practices in cowpea production in northeast Brazil by Dr. Peter May (US). He is also examining the role of women in cowpea production but much of his findings are not yet published.

b. United States

Dry mycelium research with M. anisopliae and B. bassiana: studies are underway on methodologies to improve the production, handling, storage and dissemination of entomopathogens. These include: (1) harvesting and preservation parameters affecting conidiogenesis, (2) formulation of dry mycelium, (3) bioassay of dry mycelium, (4) incorporation of UV protectants, and (5) dry mycelium as a soil inoculum.

2. Research results disseminated and in use

a. Project had 13 research publications and reviews in press in 1987; 20 presentations at meetings; and 10 papers by short-course students.

b. The 90 trained agriculturists contribute directly to dissemination of the technology.

c. Build up of a large resource (240 isolates) of entomopathogenic organisms

d. Production and formulation of inoculum methodologies are expected to be used both publicly and privately.

e. Innovative bioassay system for Erynia (an entomophthorales)

f. Method for humidity control at leaf surfaces

g. Development of entomopathogens for soil insect pests

3. Other research-related results

a. Cataloguing of 240 collections of entomopathogens

b. Production and distribution of CRSP-produced materials: mycelia and conidia distributed to several labs in US and abroad

c. Needs of small farmers and women: the project has consistently aimed at urgent needs of the disadvantaged in

terms of developing low cost, environmentally safe controls for serious pests. This will increase production, availability and predictability of bean supply.

B. Changes in National Production of Beans and Cowpeas in Host Country

The project has not yet contributed to changes in production, but the longer term impact on control of pests will increase yields and improve stability of production.

C. Training

1. Numbers and kinds in process

Not available

2. Numbers and kinds completed

Not available

3. Project training targets during three-year extension period (1986-89)

L. Leite completing M.S. in Brazil, C. A. da Silva (B.Sc.) receiving intern training, Magalhaes trained with Brazilian funds, and a one-week short course on microbial control will be taught in Brazil in 1988.

D. Institutional Development

1. New CNPAF administration (1986) is highly cooperative and enthused about the project's objectives.

2. Current status of institutionalization: the CNPAF intends continuing the project unit on termination of the CRSP. Prospective PI is training (Ph.D. level) at Cornell.

E. Progress in Relation to Log Frame

Generally on target in the four areas:

1. Reduce cowpea losses to insect pests: need to commence field testing phase.

2. Establishment of a permanent insect pathology resource center at CNPAF is well advanced.

3. Training of Brazilian scientists is largely completed.

4. Creation of a database on cowpea insects and pathogens is in process and on schedule.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

No audit yet carried out, but BTI welcomes. Project expenditures both in the US and Brazil have consistently been fully documented.

B. Adequacy of Funding

1. AID--Funding is marginally adequate.

2. Host Country--Severe budgetary problems but about $48,000 committed for 1988.

3. US Institution--BTI has made substantial contributions from the project's inception--it is both appropriate and adequate.

C. Problems

1. Support from the Bean/Cowpea CRSP is unpredictable from year to year.

2. Necessity of purchasing US commodities even when manufactured in Brazil.

D. Adequacy of Current Policies and Procedures

Present procedure, though laborious and slow (one-month average), seems to be working well: bills prepared, scrutinized in Brazil and forwarded to BTI for payment.

III. PLANNING

A. Work Plan for 1987

Not available

B. Review of 1987 Work Plan During Implementation

Not available

C. Plans for 1988

No major changes anticipated.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

Insects are perhaps the major and most difficult problem of cowpeas worldwide. The only viable alternative option is use of expensive and dangerous chemical insecticides (mostly imported.). Therefore, the project is important and should be afforded high priority.

B. Balance between Research and Training

The project has always stressed training in terms of annual short courses (15 students each), internship training up to one year for post baccalaureates, and degree training (5 M.S. and 1 Ph.D.). However, the training is complemented by excellent research. Balance considered excellent.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

Considerably more than half the USAID-provided funds were expended for Brazil.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

The project has developed a very high level of collaboration between BTI and Brazilian institutions, especially the CNPAF. About five US and ten Brazilians have worked closely and harmoniously together for at least three years. US PIs travel frequently to Brazil and the project has had two US Research Associates in residence in the HC. EMBRAPA has expressed strong desire to continue collaborating with the project.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

Commitments and contributions of each sponsoring institution (EMBRAPA/CNPAF and BTI) are clearly stated and fully implemented by all concerned.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

Participation of the US Embassy has been minimal. AID is represented by only one person, a non-agriculturist; nevertheless, he is very cooperative.

G. Domestic and International Linkages and Cooperation/Collaboration

The domestic linkages of the project are extensive and effective. In particular the linkages with the Brazilian universities are especially strong. International linkages have been made with institutions in Colombia, Mexico, India (Tamil-Nadu), and with CATIE in Costa Rica and CIAT in Colombia. In the future, collaborative studies with IRRI in the Philippines and Senegal are contemplated. However, one institution that should be included is IITA in Nigeria.

H. Cost Effectiveness

The project is highly cost effective considering the number of organizations and individuals involved, training carried out, linkages formed, and research results obtained.

I. Institutionalization of Host Country Component

The former Chief of CNPAF, Dr. Almiro Blumenschein, as well as his successor, Dr. Emilio Castro, are highly supportive of the project as evidenced by: (1) designating a large lab as the "Insect Pathology Laboratory," (2) assigning a senior scientist to near full time on the project and (3) encouraging other senior scientists to work in collaboration with the project in various activities.

V. PUBLICATIONS

A long list of publications (33) was prepared in 1987. Virtually all of these had multiple authorship representing both US and HC participation.

VI. OVERALL RATING: 1--Highly Satisfactory

This is a very successful CRSP project. Considerable information on pathogens, host insects, and farming practices is now available through the Bean/Cowpea CRSP activities on cowpeas and beans in Brazil and the US. There is also evidence for massive, wholehearted collaboration among participants both in the US and Brazil. What remains is to undertake extensive field trials to validate experimental results. The EEP recognizes the urgent importance of more practical, safe methods of insect control particularly in the major cowpea-producing regions of Africa and recommends consideration of adapting this approach in East and West Africa in collaboration with IITA.

VII. COMMENTS ON THE EXTENSION PROPOSAL

The EEP recommends approval of the extension proposal.

1987 EEP REVIEW

CAMEROON/PURDUE UNIVERSITY/Murdock

Preservation of Postharvest Cowpeas by Subsistence Farmers in Cameroon

This CRSP project, reorganized March 1, 1987, has been operating for less than one year; therefore, the usual review procedure is inappropriate at this time. Nevertheless, the EEP comments on the planning and initiation of the new project's efforts in 1987.

1987-88

This project is entitled "Bean/Cowpea CRSP Purdue/Cameroon Storage Project" but its goals, purposes, inputs and outputs as stated in the Log Frame include much more than storage and storage-related activities. For example, a major program goal is to "build an institutional capacity within IRA to conduct cowpea research."

The planning for the storage portion of this project inspires confidence because the projected research activities are detailed clearly, highly appropriate--perhaps pioneering--with respect to the Vigna species and sharply focused on the needs of Cameroon, and have potential for producing knowledge and procedures useful wherever cowpeas are grown. Further, the research plan makes use of current CRSP/Cameroon experience (Dr. Ta'Ama and others), and it enlists the support of IITA and others involved in cowpea improvement in Africa. This is important, for with on-farm, food grain storage projects there is always the element of "re-discovering the wheel."

The institutional development portion of the project inspires less confidence, in that a three-man team is expected to " . . . be able to carry out research to foster production and preservation of cowpeas after the CRSP expires." Also, the statement of the institutional development program objective is so open-ended that in time it could become the rationale for engaging in almost anything related to cowpea research in Cameroon.

In addition, reference is made to "facilities." There is no description of these facilities and their importance nor is there comment on/provision for their funding.

COMMENTS ON THE EXTENSION PROPOSAL

The work plan for FY 89-92 is outstanding--very impressive in every major aspect of the research to be undertaken. If the plans have a defect/flaw, it may be that they are overly ambitious, given prevailing conditions in Cameroon with respect to personnel, facilities, travel and operating procedures--the things which have caused problems in the past. There is no indication in the extension proposal or elsewhere from the ME/MO that these conditions are no longer serious impediments to the success of this new endeavor. The project seems to suffer from the same disabilities that were a problem before its

reorganization. Moreover, though the new project is intended to concentrate on storage, the papers sent to the EEP suggest that many other activities are likely to be undertaken.

Notwithstanding the above comments, the plan is a clearly delineated, reasonable course of action which warrants approval if conditions in Cameroon so indicate and CRSP authorities are satisfied with the title and the implications of the institutional development portion of the project.

1987 EEP REVIEW

DOMINICAN REPUBLIC/UNIVERSITY OF NEBRASKA/Coyne

Biology, Epidemiology, Genetics and Breeding for Resistance to Bacterial and Rust Pathogens of Beans (*Phaseolus vulgaris* L.)

I. PROGRESS

A. Specific Research Contributions

1. Research in process

a. Dominican Republic

The research underway in the DR on rust, common blight and other diseases is comprised mainly of field testing/selection and/or crossing of improved lines from Puerto Rico, CIAT and Nebraska. A number of such crosses and introduced lines appear promising for possible future release after additional testing.

b. United States--Nebraska

Researchers continued laboratory and field investigations directed towards better understanding the biology, epidemiology and genetics of the causal agents for rust and bacterial diseases of beans, and towards developing improved/superior breeding lines and cultivars. Examples of progress: superior, disease resistant red mottled, black and white bean lines have been developed for possible release; a positive correlation has been found between rust disease resistance and leaf hair density; surveys indicate that monitoring the incidence and magnitude of natural populations of *Xanthomonas campestris* pv. *phaseoli* (causal bacterium of common blight) could be used to predict possible outbreaks of bean blight; the prevalence and survival of pathogenic strains of *X. c.* pv. *p.* on certain weeds may result in infections in bean fields even if bacterial free seed is planted; inoculation studies with *X. c.* pv. *p.* indicate that breeding for reduction or elimination of the transmission of the organism in seed could serve to help control common blight; the "I" gene, which confers resistance to CBMV, was found in a DR red mottled line.

c. United States--Puerto Rico

Bean cultivar research by researchers at the University of Puerto Rico continued in direct support of the introduction of improved cultivars into the DR. Thirty-two (32) lines out of 830 red mottled lines sent to the DR were well

adapted and "showed good levels of resistance to rust and common blight."

2. Research results disseminated and in use

   a. Dominican Republic

      (1) Foundation seed of PC-50, a CRSP-produced selection, is being multiplied (8 Ha) and will be distributed to certified seed producers for further multiplication and general use.

      (2) The fungicide, Brestan 60, available in the DR, has been tested and is being recommended for control of web blight.

   b. Elsewhere

      Germplasm sharing: red mottled lines (82) sent to Haiti and to Tanzania; white seeded lines (14) sent to Peru; and selected lines with special characteristics were sent to CIAT for use in the breeding program.

3. Other research-related results

   a. Germplasm conservation and use

      (1) Nebraska

         Germplasm resistant to rust, CB, halo blight, white mold and bacterial wilt are being maintained, along with a wide collection of teparies and isogenic lines.

      (2) University of Puerto Rico

         A collection of phaseoli species

      (3) Dominican Republic

         Twenty-eight DR accessions of Pompadour, red mottled seed types were collected and added to the existing 1200 bean accessions in the genebank.

      (4) International exchange

         With the University of Puerto Rico, USDA-TARS, UC-Riverside and Davis, University of Nebraska, Honduras and Tanzania

   b. Seed production and distribution of CRSP-produced cultivars

      The PC-50 selection made by DR is being multiplied for general use.

c. Impact of other CRSP-produced or recommended technology

None reported

d. Contributions to and participation in international bean/cowpea networks

(1) Participation with CIAT has been outstanding.

(2) Active in the PCCMCA

(3) Excellent interaction with other CRSPs

e. How research findings address the needs of women and small-scale farmers

Research and related activities are highly relevant to the needs of small farmers; i.e, directed towards increasing the output and availability of beans, increasing incomes and improving nutrition.

B. Changes in National Production of Beans and Cowpeas in Host Country

Year	Harvested Area hectares		Production metric tons		Kg/ha	
	Red	Black	Red	Black	Red	Black
1981	45,736	13,401	30,126	14,091	790	1,051
1982	35,939	8,277	27,781	7,176	773	867
1983	48,577	7,075	33,918	5,318	698	752
1984	58,647	5,100	42,247	4,724	720	926
1985	43,370	8,426	35,066	8,071	809	956
1986	38,295	4,292	25,173	3,193	658	744

Bean productivity and production have declined significantly over the past five years, if the above data are accurate. USAID officials reported to EEP reviewers that DR statistics are unreliable; nevertheless, some assessment of what is happening to bean production in the DR should be made by CRSP officials.

C. Training

Not reported

The following is quoted from the recent EEP Review conducted in the DR in November 1987: "Before any additional commitments are made to long-term, expensive out-of-country degree training, the PIs should consider preparation of an analysis of CRSP staffing requirements and develop a training plan through the next extension of the CRSP. Such an analysis and plan should reflect (a) the ability of the DR to retain highly-trained technicians/scientists and (b) a realistic, DR-supportable staffing pattern for bean improvement in the DR."

D. Institutional Development

1. Changes in 1987

The DR Government has begun to assume payroll responsibility for DR employees assigned to CRSP activities: five technical workers, one secretary and two laborers were transferred to the DR payroll in 1987; however, given the DR's financial circumstances, the prospects are not bright for early transfer of all local employees to the DR payroll.

2. Over the life of the project

a. Creation of a national, coordinated bean research program which is an element of the national legume program. The effectiveness the program at the present time is conjectural--perhaps it is too soon to tell.

b. Improvement of physical facilities at two research locations. The research station at San Juan, though small, is impressive and reflects credit to the CRSP staff and others at that location.

c. The DR now has a small but impressive team of bean scientists/technicians led by PI Freddie Saladin and Eladio Arnaud Santana, Director of the experiment station at San Juan, where most the CRSP research is located.

3. In prospect

Promising, but the future will depend on retention of trained personnel, strong support from the DR Government and continued help of external donors. This project is at a critical stage. If current personnel remain in place and no setbacks occur, this project could make impressive contributions--superior, disease-resistant varieties--to bean production/improvement in the country. Continued US support will be a major determinant of events over the next several years.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

Audit of the DR portion of the project made by the local representative of the Arthur D. Anderson Company in June 1987. Report not yet published.

B. Adequacy of Funding

The US PI reports "The reduction in the budget has reduced our ability to achieve research goals particularly in area of bacterial epidemiology and in our understanding bacterial genetic processes

and gene transfer. It was necessary to eliminate the Research Associate position in bacteriology and there is not enough funds for future graduate students, supplies, enough travel to the DR, and for research in DR, NE, and UPR. It is difficult to manage the budget, keep up morale of personnel and achieve objectives with the continued reduction in budget." The EEP notes the sizeable carryover of FY 86 funds and the substantial unspent FY 87 balance.

Funding for research projects by the DR Government is reported to be minimal and devoted mainly to the payment of salaries. Inflation is serious and has limited the purchase of expensive imported supplies and equipment. The CRSP has made a difference in this regard through provision of some research support.

The question of whether AID funding is adequate is clouded by the accumulation of unspent funds. A thorough review by the TC, MO, PIs and, perhaps, senior DR officials is needed to set funding priorities and an agreed course of action. It may be that an "understanding of bacterial genetic processes and gene transfer," for example, is not the most urgent need to get bean production up in the DR.

C. Problems

The US PI reports "Budgeting gets more difficult each year--less money and more reporting." He also reports that the subcontract with UPR seems to be a suitable arrangement.

D. Adequacy of Current Policies and Procedures

PI-suggested changes: simplified paperwork and less frequent project reviews

III. PLANNING

To be completed

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

All activities are appropriate and if continued should contribute importantly to bean disease control in the region and elsewhere; however, they may fail to pay expected dividends in the DR because of the probable existence of other constraints influencing their effective use. Specifically, the current narrow focus on blight and rust does not provide for attention to other yield/production limiting factors, including other diseases that are becoming increasingly important in the DR. Unfortunately, the scope of bean improvement in the DR appears to be limited mostly to that of the CRSP. This matter should be reviewed by the TC and MO, to determine if this is case and, if so, what can be done.

B. Balance between Research and Training

Satisfactory. CRSP research and training activities are being complemented and supplemented by regional institutions such as CIAT and IICA.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

Acceptable; however, the balance should be reviewed in the light of the DR's pressing needs and the current relevancy of some of the work in Nebraska to those needs.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

An exceptional level of collaboration/cooperation has been established between the DR, UNL and UPR. The rapport and productive interaction is remarkable and is the kind of relationship envisioned by those who conceptualized and organized the AID/US University Collaborative Research Support Program.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

Outstanding contributions by centers of excellence in bean research/improvement--UNL, UPR, CIAT, and IICA--in support of the DR. The division of labor/effort is probably a model of international cooperation.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

So far no tangible support; however, the USAID officer assigned to work with the CRSP understands and appreciates the CRSP and its objectives. Though invited, no USAID official has visited and observed the work underway at the San Juan experiment station where most the CRSP work is in progress. During an EEP visit to the USAID Mission, officials ruled out direct support to the CRSP; thus, unless there is dramatic change, USAID involvement appears remote. Nevertheless, CRSP officials should continue their efforts to secure USAID support.

G. Domestic and International Linkages and Cooperation/Collaboration

Very satisfactory

H. Cost Effectiveness

Exceptional. Cooperating scientists of the UNL and UPR are world class, highly regarded leaders in their fields. Through the CRSP, AID is getting exceptional talent involved "on the cheap." Alternatives such as direct hire and-or consultants would cost more than the total project.

I. Institutionalization of Host Country Component

Through the CRSP, a national bean program with staff, facilities and a program has been established. Though fragile and limited in scope, it is operational. A great deal of credit must go to the staffs of the UNL and UPR and the small team of dedicated persons in the DR who made it possible.

V. PUBLICATIONS

Very satisfactory by the DR, UNL and UPR

VI. OVERALL RATING: 2--Satisfactory

By several measures, this is a highly satisfactory project with reports that it is nearing the payoff stage, but so far--after six years--it has had no discernable, positive impact on the production and availability of beans in the DR. The bean production situation in the DR vis-a-vis the CRSP requires review to determine how CRSP activities, current and contemplated, fit in and support priority needs of the DR.

VII. COMMENTS ON THE EXTENSION PROPOSAL

The EEP suggests that this project receive extension for one year (May 1990). A limited extension period will avoid disruption of current activities, while providing time during the next regularly scheduled review for a thorough evaluation of the circumstances influencing bean research and production in the DR and the ways in which the CRSP is a part of and is influenced by these circumstances. This course of action is suggested because the signs and indicators are mixed and confusing. On the one hand, the project gives evidence of being an excellent research effort--outstanding researchers apparently making steady, substantive advances in knowledge and in developing improved, disease-resistant breeding lines in a highly favorable collaborative mode. Just what a project should be! On the other hand, the environment in which the project operates may be thwarting the effective application of research results. To date there have been limited dividends to a substantial investment--a meager payoff. After six years and thousands of dollars, there are few, if any, evidences of progress in bean production improvement in the DR; in fact, what evidence there is--reliable or unreliable--indicates that bean productivity and production in the DR is declining steadily.

Before proceeding for several additional years with more of the same, CRSP and DR officials may wish to determine what are the most urgent bean production needs in the DR and how the proposed extension activities support them. In this connection, are the assumptions on which this project was organized still valid? For one thing, it now appears that the project constitutes much of what is the DR's bean program. If this is the case, then it is may be important to determine if activities sponsored by the CRSP should be limited to disease production constraints. Given its strong position of influence in the country, perhaps the CRSP could help the DR develop a more balanced bean improvement program, if review indicates that is what is needed.

1987 EEP REVIEW

GUATEMALA/CORNELL UNIVERSITY/Wallace

Agronomic, Sociological and Genetic Aspects of Bean Yield and Adaptation

I. PROGRESS

A. Specific Research Contributions

1. Research in process

Summarized the extreme complexity of the yield systems into only three processes.

Elucidated a more integral role in yield accumulation by the photoperiod genes than the effect on adaptation which has been recognized for 60 years.

Developed complete and partial yield system analysis procedures.

Showed that only "one" photoperiod gene differentiates certain early from late maturing temperate zone beans.

Demonstrated at ICTA that selection for the seed weight accumulated per day of plant growth eliminates necessity of testing the lowest yielding progenies in yield trials.

Anticipate verification of the effectiveness of the yield system analysis in an applied breeding program.

Anticipate the production of several articles summarizing the work that has been conducted over the past few years.

2. Research results disseminated and in use

Not reported

3. Other research-related results

Not reported

B. Changes in National Production of Beans and Cowpeas in Host Country

Guatemala is now self sufficient in beans. Per hectare yields are increasing. Farmers are adopting ICTA produced cultivars.

C. Training

Scully completed Ph.D. at Cornell during 1987.

Monterosso is nearing completion of M.S. degree at Cornell.

Herrera completed two-week short course at Cornell on AMMI analysis.

Total of 3 Ph.D.'s and 2 M.S.'s completed to date.

D. Institutional Development

Masaya has returned as Bean Program Leader at ICTA.

CRSP results are fully incorporated into the Bean Program at ICTA.

The overall potential impact of the yield systems analysis and the AMMI analysis on the efficiency of the breeding programs at ICTA and in New York remain to be evaluated.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

No audit has been performed nor requested.

B. Adequacy of Funding

1. AID--CRSP-wide reductions have not seriously impacted the biologic research of this project because of the reductions in the socioeconomic portion. The return of Monterosso will require the purchase of another vehicle.

2. Host Country--HC expenditures have been reduced nearly three-fold by devaluation of the Quetzal. HC expenditures were further reduced by slow transfer of funds from the Guatemalan bank to ICTA. Addition of Monterosso to team will increase HC funding needs.

3. US university--Not covered

C. Problems

Funds were not flowing smoothly between the US bank used by Cornell and the HC bank used by ICTA because the HC bank was slow to reply with statements that it was ready to receive funds from the US bank. Presumably this has now been cleared up.

D. Adequacy of Current Policies and Procedures

ICTA is currently organizing a foundation to receive and manage grant funds. This will eliminate difficulties from having to incorporate CRSP funding into the national budget and manage it using national policies.

III. PLANNING

A. Work Plan for 1987

Not available

B. Review of 1987 Work Plan During Implementation

Not available

C. Plans for 1988

Changes from previous plans have been refinements and built on prior findings.

Project will move toward utilization and evaluation of the results in an applied bean breeding program at ICTA.

Three to five years will be needed as a minimum to evaluate and demonstrate the efficiency of the yield system analysis.

There will be more concentration on analysis of data and less on field work.

Field work will be moving into less favorable environments (ladera and coastal lowlands).

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

There is potential global application for the improved understanding of the physiological-genetics of adaptation and yield. It is applicable toward more efficiently breeding for higher yield of beans in all countries, developing or developed. With slight modifications it may be applicable to many crops.

B. Balance between Research and Training

ICTA's bean team is among the best trained of its crop research programs. Further degree training will not be requested. The CRSP research is both basic and applied and the basic components require support from the CRSP.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

Activities at both locations seem to be very well balanced.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Outstanding

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

Guatemalan and Cornell PIs make near equal contributions.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

Mission has minimum but acceptable understanding and involvement in the project.

G. Domestic and International Linkages and Cooperation/Collaboration

In HC there are linkages with the WSU/INCAP CRSP project and with the extension service, DIGESA. In New York there are linkages with scientists from several disciplines. Internationally there are linkages with CIAT and the PCCMCA and IBSNAT networks.

H. Cost Effectiveness

Appears to be very cost effective because a major part of the cost is borne by Cornell and by ICTA.

I. Institutionalization of Host Country Component

The CRSP project is fully integrated into the HC bean program in ICTA. The Bean Program, in turn, is one of the important commodity programs in ICTA. This is institutionalization at its best.

V. PUBLICATIONS

Two important publications came out in the Proceedings of the annual PCCMCA meetings during the year, but the project suffers from a lack of a clear exposition of its results in refereed journals.

VI. OVERALL RATING: 2--Satisfactory

This project receives high marks for the nature of the collaboration between US and HC institutions and between the two PIs, as well as for the science produced. The science is also utilized in practical bean breeding programs both in Guatemala and in the US. It is resulting in products which may have both global and national impact.

VII. COMMENTS ON THE EXTENSION PROPOSAL

The CRSP has provided support for this line of research for eight years and it builds on much previous research by the same US PI. The EEP believes it is now appropriate for an independent, external and in-depth review of the extension of this project. The EEP suggests an interim extension of this project pending the conclusions of the review.

1987 EEP REVIEW

HONDURAS/UNIVERSITY OF PUERTO RICO/Beaver

Improvement of Bean Production in Honduras through Breeding for Multiple Disease Resistance

I. PROGRESS

A. Specific Research Contributions

1. Research in process

The principal objectives of this project are to identify and incorporate genes for disease resistance into bean genotypes having seed types acceptable to Honduran consumers and to help strengthen bean breeding programs of the Escuela Agricola Panamericana (Zamorano, Honduras) and the Ministry of Natural Resources (MNR), Government of Honduras.

Improvements in the operation of this project reported in 1986--more efficient organization, sharper focus and an expanded program--have continued in 1987. Some examples: 598 F_3 breeding lines from Puerto Rico were evaluated in Honduras from which 1533 individual plants were selected for further testing; several promising F_5 lines were identified; identification of 17 small, red breeding lines with dense pubesence (research conducted by the Dominican Republic project indicates that dense pubesence may provide non-specific resistance to rust; currently all small red Honduran varieties have little or no pubesence); cooperative field activities (performance testing and seed multiplication) with the MNR were carried out to facilitate and speed the release of a promising small, red line which was named "Catrachita;" and activities of the project became more integrated into the educational and rural outreach programs of the EAP, as well as with research and extension programs of the MNR. Thus, this project appears to be improving steadily with respect to the scope and productivity of its activities.

2. Research results disseminated and in use

a. As reported above, line RAB-205, a line with rust resistance in certain locations in Hondurus, was released as "Catrachita."

b. Two tons of "Catrachita" seed were produced at the EAP. This seed is being used by the MNR as Foundation Seed for further multiplication and sale to producers.

c. The project is working with a rural development project to promote the spread and use of "Catrachita" by providing small quantities of seed (2 kgs) to farmers.

d. Research findings on epidemiology and control of rust using a mixture of different components of the "Cuarenteno landrace" was presented at the 1987 Annual Meeting of the PCCMCA in Guatemala.

3. Other research-related results

a. Rust resistant germplasm distribution

A rust resistant selection of "Cuarenteno" was sent to CIAT for use in the bean breeding program.

b. Small farmers

Much effort has been placed on performance testing on small farms to help ensure that releases are likely to be suitable to the needs and requirements of small farmers. Lack of resources has prevented appropriate attention to gender issues.

B. Changes in National Production of Beans and Cowpeas in Host Country

During the period 1965-1985 an average of 41,000 metric tons were produced on approximately 74,000 hectares. Yields of beans (seed) are quite low on most farms. The average yield is 550 kg/ha. With the expected spread and use of "Catrachita," bean yields should begin to improve over the next several years.

C. Training

One student from Honduras completed the B.S. degree in agronomy and is currently enrolled in a M.S. degree program in agronomy at the UPR.

D. Institutional Development

With the assignment of Dr. Silvio Zuluaga and the designation of the EAP as the Honduran Government (MNR) agent/representative for the CRSP, satisfactory progress is being made to institutionalize CRSP activities in Honduras. Not only have the scope and quality of CRSP activities improved, but bean research and outreach activities have begun to spread to other disciplines and programs of the EAP. In particular, CRSP activities are beginning to impact the undergraduate and graduate programs of the EAP. Increasingly, the relationship between the CRSP and the EAP is becoming one of mutual support and benefit. Further, there are reports of greater, more productive relationships with the research and extension programs of the MNR.

E. Collaboration with Other Projects, Including International Linkages

Exchanging information and genetic materials has become an integral element of this project with respect to CIAT, IICA and other regional organizations and universities.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

No audit or project review conducted in 1987.

B. Adequacy of Funding

Reported to be inadequate by AID/UPR. The EAP is reported to have increased its support and helped to keep the project alive in Honduras; however, the amount of EAP support was not given. The EEP notes that 30 percent of funds available in FY 87 were not spent.

C. Problems

Late fiscal reporting by the EAP

D. Adequacy of Current Policies and Procedures

Adequate

III. PLANNING

A. Work Plan for 1987

1. TC and ME/MO guidance

Satisfactory

2. Preparation

Prepared by Dr. James S. Beaver of the UPR and Dr. Silvio Zuluaga of the EAP and approved by appropriate officials of the UPR and the EAP. The question arises as to what extent, if any, should MNR of the Government of Honduras be involved in the preparation and approval process.

3. Budget and work plan related?

Budget details not available to determine

B. Review of 1987 Work Plan During Implementation

Not reported

C. Plans for 1988

1. Research in Host Country and in US

Continuation of 1986 activities with added emphasis on bean rust resistance research with the help of Dr. James Steadman of the University of Nebraska

2. Expected changes

None reported

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

Relevant and important with regard to the improvement of small, red beans which are widely grown in Central America.

B. Balance between Research and Training

Not able to determine. CRSP training needs not provided.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

The division of activities is highly appropriate and is a model, highly productive CRSP relationship which draws heavily upon UPR and USDA bean research and resources which are located in Puerto Rico.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Excellent and mutually supportive

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

Outstanding and perhaps unique with regard to UPR and USDA; highly satisfactory with regard to the EAP

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

Close and supportive

G. Domestic and International Linkages and Cooperation/Collaboration

Satisfactory as reported above

H. Cost Effectiveness

Highly satisfactory leverage and use of US resources.

I. Institutionalization of Host Country Component

Progress satisfactory and improving

V. PUBLICATIONS

Satisfactory output by both Honduran and Puerto Rican authors/members of the project

VI. OVERALL RATING: 2--Satisfactory

Though bean yields and bean production are stagnant in Honduras, research and extension activities by Honduran institutions, strongly and effectively supported by the UPR and USDA through the CRSP project, give promise for steady increases in bean productivity and production (assuming other yield-limiting factors are favorable).

VII. COMMENTS ON THE EXTENSION PROPOSAL

Except for the sections on training and the budget, the proposal for extension is well-prepared and clearly delineates reasonable, progressive and promising activities which build on this project's accomplishments to date and on capabilities of participating personnel/institutions. If the TC and the ME/MO are satisfied with the plans to expand the project to include research on drought tolerance, early maturity and work using molecular biological techniques (i.e., if funds, expertise, facilities and other requirements are available), the EEP believes this request is acceptable for approval since the additions are needed and will complement and enhance the effectiveness of current activities.

1987 EEP REVIEW

INCAP/WASHINGTON STATE UNIVERSITY/Swanson

Improved Biological Utilization and Acceptability of Dry Beans

I. PROGRESS

A. Specific Research Contributions

1. Research in process

a. Hard-to-cook

Kansas State University has obtained evidence that the action of phytase on phytate triggers the development of the hard-to-cook state in beans.

Washington State University is investigating the role that bean cotyledon cell walls play in the hard-to-cook phenomenon.

Michigan State University has determined that as the temperature during storage and the moisture content of the beans increased, the cooking time also increased.

b. Protein digestibility and quality

Removal of the seed coat increases protein digestibility, and removal of water, NaCl and NaOH soluble protein increases protein digestibility.

Michigan State University continued to characterize indigestible components in beans and delineate the genetic factors involved in bean indigestibility.

Results obtained to date reinforce previous findings that white beans are nutritionally superior to red and black beans, but the reasons for the superiority are not evident.

c. Cultural and economics research

Washington State University collected substantial information on the production, marketing and consumption of beans from rural households in the villages of Nahuala and Patzicia, Guatemala.

2. Research results disseminated and in use

Determination of cooking times for beans has become a common research practice.

Accelerated storage techniques have been developed and are commonly cited.

Common beans are screened for nutritional and cooking quality.

Legume research programs dealing with nutritional and cooking quality are more numerous and prevalent.

3. Other research-related results

Impact of Mattson cooker is significant--cooking times are a standard technique available to assist research and field selections of bean cultivars.

The project has contributed an appreciation for nutritional quality and consumer acceptability of beans among bean breeders, bean production scientists and farmers.

B. Changes in National Production of Beans and Cowpeas in Host Country

Not relevant to this project

C. Training

A total of twenty US citizens, and ten citizens of other countries (not Guatemala) have been involved in degree (B.S., M.S. and Ph.D.) training at US universities.

A total of thirteen Guatemalans have been involved in B.S. and M.S. degree training at INCAP.

D. Institutional Development

Not covered

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

1. Audit in early summer at INCAP

2. Project management reviews

March 27-April 1, 1987--Freed/Hortik
July 15-17, 1987--Hildebrand

B. Adequacy of Funding

1. AID--Support satisfactory

2. Host Country--INCAP has requested $150,000 in PL 480 funds to support the analysis of samples from ICTA to assess quality of advanced lines. This would make the HC portion more useful.

3. US university--Not covered

C. Problems

The system works reasonably well. Allocation of funds is in awkward fractions, generally after the start of the funding period. Accumulation of receipts is a workable, yet sometimes slow process. Year-end budget estimates and encumbrances are often a speculative and slow process.

D. Adequacy of Current Policies and Procedures

Current policies and procedures are cumbersome, requiring administrative reporting responsibility beyond financial rewards of research support.

III. PLANNING

This project suffers from a lack of effective collaboration in planning and in carrying out the research. Communication between US and HC PIs appears to be more concerned with financial matters than with research content. Some duplication could result. US PI sees few changes in new work plan.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

Research activities contribute significantly to global constraints involving cooking time and nutritional quality of dry beans.

B. Balance between Research and Training

Project research is conducted primarily by graduate students in the US and by undergraduate and graduate students and technicians in the HC. The large number of students trained in bean research has provided adequate research/training balance. However, training of HC students in the US has not been successful.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

Difficult to assess but appears to be adequate. Enhanced collaboration between PIs would help assure balance and lack of duplication.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Needs improvement

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

The US universities (WSU, KSU and MSU) collaborate well with each other and are involved in review and planning of research objectives. Each university contributes research experiments toward specific objectives as delineated. HC institution also makes important contributions, but it is less well coordinated with the US institutions.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

Limited but adequate

G. Domestic and International Linkages and Cooperation/Collaboration

INCAP and ICTA linkages exist but could be strengthened. INCAP also has linkages with Purdue University, CENTA in El Salvador, Nicaragua, Mexico and the PCCMCA network. Through the three US universities there are many other linkages.

H. Cost Effectiveness

INCAP uses many low paid researchers in an innovative program. Its portion appears to be particularly cost effective when measured by the quantity and quality of published research results. The US portion appears to be adequate, but no real evaluation has been made.

I. Institutionalization of Host Country Component

The research is completely institutionalized in INCAP, which has a number of internationally funded projects.

V. PUBLICATIONS

All collaborating institutions have an excellent publication record and the results from this project are no exception.

VI. OVERALL RATING: 3--Satisfactory, CRSP officials may wish to consider major adjustments

This project is conducting some imaginative research. However, there appear to be problems in coordination between the US and the HC components. It is possible that there is an overlap of efforts. Also, it is difficult to understand how the results are being, or will be, translated into application. An increase in the collaboration between the two Guatemalan projects in this CRSP would enhance the application of the results.

VII. COMMENTS ON THE EXTENSION PROPOSAL

The project should be extended but with heavy emphasis on incorporating findings into practical recommendations. The MO may wish to find ways

to enhance the coordination between the US and the HC components so that it conveys the feeling of being a unified project whose efforts are more cumulative.

The EEP would welcome a systematic monographic account of the present state of knowledge of the different attributes that constitute the hard-to-cook phenomenon (including botanical, enzymological, biophysical, chemical and textural aspects) and of the possible methods of alleviating it by agronomic, breeding and culinary means with examples of past successes and failures.

1987 EEP REVIEW

MALAWI/MICHIGAN STATE UNIVERSITY/Adams

Genetic, Agronomic and Socio-Cultural Analysis of Diversity among Bean Landraces in Malawi

The EEP Scope of Work format which is being used to review the other projects of this CRSP is inappropriate for reviewing the Malawi project, given its nature and stage of development.

The following is quoted from the last year's review:

> Project is judged satisfactory; however, in January 1986 the EEP recommended that phaseout of this project be considered. The EEP reiterates this recommendation because the project appears to have completed its tasks and the EEP does not envision further development gains in the short term in Malawi by its continuation. We hope the diverse genetic materials and information will not be lost. The EEP encourages the completion of the analysis of the 1984-86 socio-cultural data.

The EEP reaffirms the success of this project in achieving its objectives and commends the Principal Investigators and their associates for their endeavors which have been consistently rated highly satisfactory through 1987. The research results of this project have been published and circulated widely in journals and magazines. The findings have contributed to a better understanding of the processes involved in the generation and maintenance of genetic diversity in beans grown in Malawi. They are expected to be of value in future bean improvement programs in Malawi and elsewhere.

The social science component--strong complement to the biological component--has highlighted the importance of members of households, especially women, in seed selection and use in maintaining genetic diversity. With regard to this component, the EEP notes that in 1987 the project has embarked on a new socio-cultural investigation in a rural development project area near the capital, Lilongwe. Previous social science research (1980-85) was conducted in northern Malawi. The new initiative is reported "as the first part of a three-stage investigation of the socio-economic factors underlying bean genetic diversity in the Central Region of Malawi. . . ." The reported data are quite illuminating in many respects, but the small sample--17 households--and the manner in which the sample was chosen may compromise confidence in this investigation.

With regard to the proposed three-year extension, there is no indication in the proposal that circumstances in Malawi with regard to Host Country support for the project have changed sufficiently to justify continuation as a CRSP project (see Report of the External Evaluation Panel, Bean/Cowpea CRSP Five-Year Review, January 19-24, 1986). If conditions have changed enough to warrant continuation (the recent EEP site review indicates they may have), CRSP authorities may wish to consider reorganizing and continuing CRSP activities in Malawi, given the sizeable CRSP investment in Malawi and the excellent working relations developed over the years. See detailed EEP notes on extension of this project.

COMMENTS ON THE EXTENSION PROPOSAL

The Malawi project has achieved most of the scientific goals set out in the original log frame. Moreover, it did this largely through the work of expatriate scientists, so that it has been regarded as insufficiently institutionalized in the HC institution, Bunda College. For these reasons it has been felt that the project should be terminated. However, there are important countervailing considerations:

A. The scientific objectives set out in the original log frame can now be seen to be incomplete; they were concerned with how diversity is maintained in populations of beans in Malawi, but not with the reasons why farmers act as they do to maintain and control it. It now seems possible and necessary to study this in a further phase of socio-technical surveys.

B. The results of the studies of farms and farmers in Malawi have not yet been completely analyzed or published. It is essential to do this so that the work is not at risk of being wasted and because the rural service agencies of the Government of Malawi want the information and the results.

C. Although the project has identified lines (as well as populations [mixtures of lines]) which give large and stable yields, no materials have yet been made available to the Ministry of Agriculture--which expects to receive at least some before the project ends. The lines available seem also to include some which have useful levels of resistance to disease, some which are better adapted than others to dry conditions, and some which may fix more nitrogen than others. These materials should receive further attention.

D. The genetic resources of beans collected and assembled in Malawi have not yet been sufficiently evaluated, documented, or conserved.

E. The publication of past work is not complete.

F. The Department of Crop Production at Bunda College now includes a team of Malawian scientists, four of whom were trained by the CRSP. Although their salaries will be paid from the College budget, these graduates need external help to enable them to take up their collective research duties for the Government of Malawi, which gave the College responsibility for the national bean program several years ago. The Government has not been able to provide fully adequate funding. As these new researchers develop their work, the project and its activity should become securely institutionalized in the country and other sources of support should be found. The return of the Ph.D. student in food science will further strengthen the team.

G. The US PI, Dr. Adams, has proposed an extension based largely on a study of a scientific topic new to the CRSP, the co-evolution of cultigens and pathogens in the two main races (Andean and Central

American) of beans. This is a long-term scientific undertaking whose practical outcomes would inevitably be some distance ahead. It does not attract great enthusiam from the EEP or from the Malawi Ministry of Agriculture, which is understandably concerned with more immediate developmental benefits.

The EEP recommends that Bean/Cowpea CRSP activities in Malawi be continued for an additional three years, if the project can be re-structured to more closely address national bean improvement needs as agreed to and supported by the Ministry of Agriculture and Bunda College. The EEP does not recommend approval of the extension proposal in its present form.

In its review of the Malawi project and the extension proposal, the EEP identified tasks and activities which may be appropriate for an additional three years. They are summarized below; CRSP authorities may wish to consider them for use in discussions with Malawi authorities. Such a set of tasks, if completed successfully, should help leave in place a thriving national research capability and contribute importantly to strategies and programs of bean improvement in East Africa and, perhaps, elsewhere.

A. To complete the uncompleted tasks of the earlier work (analysis and reporting of data from earlier field studies not completed in the present grant period; publications; description, partial evaluation, documentation and conservation of genetic resources of beans held in Malawi, in association with CIAT and IBPGR; training).

B. To multiply and make available to the Ministry of Agriculture improved lines of beans already identified and to establish a systematic program of selection, screening and release. (A crossing program, aimed at combining specified characters which are not already combined in existing lines, should not be undertaken before the program seems sufficiently stable for eight to ten years ahead. The natural levels of outcrossing are sufficient to generate new varieties, and so it does not seem necessary to make crosses solely to increase variability.)

C. To study the environmental and agronomic selection pressures acting from year to year on bean populations in Malawi and the relation between their effects on population structures and the countervailing selection pressures exerted by farmers.

D. To study the differing characteristics of selected lines in respect to disease resistance, biological nitrogen fixation, adaptation to dry conditions of different defined sorts, and potential yields.

E. To use selected lines as suggested in B above.

A three-year program of this sort, conducted in collaboration with MSU, should leave in Malawi a thriving national research team and endeavor for bean research.

1987 EEP REVIEW

MEXICO/MICHIGAN STATE UNIVERSITY/Adams

Improving Resistance to Environmental Stress in Beans through Genetic Selection for Carbohydrate Partitioning, Water Use Efficiency and Efficiency of Biological Nitrogen Fixation

I. PROGRESS

A. Specific Research Contributions

1. Research in process

Prior research and experimental observations show that bean genotypes differ in response to drought. Drought-tolerant strains tend to (a) have greater biomass at anthesis, (b) have carbohydrates remobilizing from vegetative to reproductive structures thereby reducing photosynthesis, (c) have more deeply penetrating taproots and thereby higher root/shoot ratios, and (d) show stomatal closure in response to drought. Some bean genotypes may have the capacity to respond osmotically to simulated moisture stress. In repeated trials of thousands of entries under moisture stress, a few genotypes consistently demonstrate drought tolerance. Among the progeny of a cross between a high N-fixing line (UW 21-58) and a drought-resistant line (II900-5-M-45 from Mexico), three selections have been shown to produce higher total dry weight under conditions where BNF was the only source of N.

In the BNF studies, (a) efficiently fixing competitive strains of Rhizobium have been identified, (b) large differences in nodulating ability between bean genotypes has been shown, and (c) a high correlation has been demonstrated between competitive ability of a bacterial strain and its speed of inducing nodulation. A strong negative effect on strain competitiveness (Rhizobia) results from high temperatures; nodulation and nitrogenase activity are greatly reduced in dry soils. However, some efficient N-fixers can be isolated from native populations in the semiarid soils of Mexico. Some of these isolates survived in low frequency as long as 96 days in dry soil.

The project has identified several genotypes of different seed types and somewhat narrower plant types that possess greater tolerance to drought. However, the tolerance mechanisms have not necessarily been identified and characterized for each, nor has the kind of drought been explicitly defined.

Experiments carried out and/or analyzed and written up in FY 87 include the following:

a. Identification of morphological and physiological parameters associated with resistance to drought

Under drought, most entries (16) matured 5-11 days earlier, some entries showed significant reduction in stem weight and some entries exhibited lower leaf water potential. However, these manifestations were not consistent between tolerant and non-tolerant strains (e.g., A322 from CIAT and Durango 222 from Mexico). Some good performing lines like Bayo Durango, Pinto Nacional #1 and A322 showed consistently lower/more negative leaf water potential under supplemented moisture than under drought stress. The PIs conclude they have not identified all stress tolerance mechanisms involved.

b. Uniform trial of 16 genotypes in the temperate semiarid zone of Mexico

Over five locations in north-central Mexico, some genotypes were clearly superior under both drought stress and favorable conditions: II-3-M-3-M-M and II-933-M-52-2 had regression coefficients on the environmental index of 1.22-1.24 with minimal deviations. These two entries are proposed for commercial release.

c. Evaluation of bean genotypes under irrigation, normal rainfed and drought conditions in the field over a four-year period

Entries varied from 49 to 64 depending on year and location. From results at four locations, three early (89 days) and four late-maturing (93-194 days) entries were identified as consistently superior under both stress and irrigated conditions. Early types were significantly lower yielding than intermediates under stress, and intermediates were significantly lower yielding than lates under stress.

d. Characteristics related to yield of dry bean (Phaseolus vulgaris L.) under water stress conditions

This M.S. thesis by Sr. Jorge Elizondo-Barron was carried out with eleven bean strains on a sandy loam soil subject to drought. Elizondo concluded that drought-adapted cultivars would be characterized as having: (1) a relatively high biomass at flowering, (2) a vigorous deeply penetrating root system, (3) a high root/top ratio at anthesis, (4) high biomass at physiological maturity, and (5) the ability of stomatal closure under moisture stress.

e. Drought mechanism in bean plants

This thesis study carried out by Sr. Fernando Castro Barraza used three levels of PEG in nutrient culture as an osmoticum,

and four genotypes of beans including Ph. acutifolius. He found that (1) each morphological character measured was reduced as the osmotic potential increased from -0.4 to -1.4 MPa, (2) the root/shoot ratio increased in only two genotypes, L1213 and Ph. acutifolius in response to water deficit, (3) leaf water potential diminished as water deficit increased, and (4) diffusive resistance of leaves increased in three of four genotypes (but not in navy bean N800122) with increase in water deficit.

f. Yield under well watered and drought stress conditions of selected bean genotypes derived from a series of crosses involving parents of diverse genetic background

This trial was conducted by J. Acosta with thirty genotypes grown under rainfed/irrigated and rain-sheltered conditions in Durango. Two entries, Dgo. 222 (adapted cultivar) and an experimental entry 39-17-1, were the most drought tolerant. Other superior entries were observed: 8-42-M-2, 8-42-M-1, 8-4, 8-17 and 39-17-1. They demonstrate the feasibility of breeding for drought resistance.

g. Biological nitrogen fixation (BNF) and dry matter yield of twenty-six dry bean genotypes

This includes two of the same entries as in (f) but received no supplemental N-fertilizer. Selected progeny of elite parental stocks tended to exceed their progenitors in both dry matter and seed yields, both indicators of superior BNF and further demonstrating possibilities for breeding.

h. Resumé of studies on biological nitrogen fixation in relation to drought

This study represents results from five experiments carried out in Mexico and supportive laboratory research at the University of Minnesota by Dr. Peter Graham. The findings included:

(1) Nodulation and nitrogenase activity were severely reduced by drought stress--down to 1/3 to 1/4 of normal.

(2) Some persistent strains of rhizobium survived up to 96 days in drying soil.

(3) Some bean genotypes (Negro 150G3) formed more than twice as many nodules as the check varieties under both stress and irrigation.

(4) Some effective rhizobia strains, especially 4MR1125 and UMR1125, were mixed with the ineffective but highly competitive strain, UMR1116. They proved highly

effective in BNF. Moreover, selected rhizobia strains were particularly compatible with some bean genotypes (Flor de Mayo, Canario 72 and Algarobo).

(5) Some strains of rhizobia were more effective at low temperature (UMR1384) and others at high temperature (UMR1073).

2. Research results disseminated and in use

a. Two new bean cultivars, Bayo Victoria and Pinto Villa, are being released in Durango State, Mexico.

b. Other contributions: two genotypes of diverse parentage which are proven tolerant of seasonal drought are being used in breeding programs and will be increased for wider distribution to bean breeders.

3. Other research-related results

a. Large numbers of bean germplasm have been screened for drought. Some are consistently superior in this respect but often lack preferred quality and other necessary agronomic characters. Therefore, greater attention needs to be given to recombining these unique materials toward developing improved commercial varieties.

b. Drought tolerance in beans is at best only partially understood. Therefore, more efforts are needed to clarify and characterize the basis of such tolerance.

c. Effects of drought on N_2 fixation is even less well understood and requires much broader investigations on rhizobiology, plant physiology and genetic controls.

B. Changes in National Production of Beans and Cowpeas in Host Country

Not available

C. Training

1. Numbers and kinds in process

a. Two new doctoral students in root/soil physiology and plant breeding at MSU began their studies in 1987; one scientist will go to UCR for his doctoral program; and a fourth individual is seeking admission to MSU for his M.S. in root system drought stress.

2. Numbers and kinds completed

A doctoral student at MSU, J. Acosta, will complete his studies in 1988 and return as National Bean Program Coordinator for INIFAP.

3. Cumulative training totals

	Completed	Initiated
Doctorates	1	3
Masters	1	1

4. Project training targets during three-year extension period (1986-89)

The University of Minnesota (P. Graham) will accept a Mexican student, J. Castellanos, to work on the inter-relationship of N_2 fixation and drought.

D. Institutional Development

Not covered

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

The project has not been audited nor has an audit been requested.

B. Adequacy of Funding

Funding has been adequate, in part because of the devaluation of the peso.

C. Problems

Some difficulties in reimbursement on account of reorganization of INIA (now is INIFAP)

D. Adequacy of Current Policies and Procedures

Acceptable--Attempts are being made to improve procedures.

III. PLANNING

A. Work Plan for 1987

Not covered

B. Review of 1987 Work Plan During Implementation

Not covered

C. Plans for 1988

1. Acosta thesis will help clarify the possibility of combining acceptable BNF and drought tolerance in a single genotype.

2. Collaboration with Silbernagel (USDA/WSU) on line-source sprinkler systems to more accurately study drought under field conditions.

3. Ibarra's research to focus on temperature tolerance in common beans at UCR and will include screening of germplasm followed by genetic analysis of tolerance.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

Considerable progress has been made in characterizing drought tolerance and in identifying a few predictably tolerant strains among small and intermediate seed classes. However, further studies are needed to fully clarify this important phenomenon, particularly in large seeded types. Work to date leads to the conclusion that drought tolerance in beans is heritable and should become an important breeding objective. Therefore, the project is highly appropriate to the Global Plan.

B. Balance between Research and Training

Greater expenditure vested in research but this is both necessary and appropriate.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

Satisfactory--Balance is toward HC.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Collaboration is excellent.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

Generally satisfactory

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

There is limited USAID presence in Mexico. The USAID representative has been supportive.

G. Domestic and International Linkages and Cooperation/Collaboration

Cooperation with CIAT, University of Minnesota, University of Wisconsin, Washington State University/USDA are excellent.

H. Cost Effectiveness

Very high owing in part to devaluation in Mexico but also to high level of cooperation.

I. Institutionalization of Host Country Component

Project well established in INIFAP and collaborating well with Chapingo, to wit: (1) continuing assignment of INIFAP personnel plus financial support of technicians, (2) plans moving forward on breeding, (3) INIFAP appointment of Acosta as National Bean Coordinator, and (4) granting of INIFAP/CONCYT scholarships to students for research on project objectives.

V. PUBLICATIONS

Satisfactory: three in 1987

VI. OVERALL RATING: 2--Satisfactory

This important project is critical to large areas and millions of people both in LDCs and the US where seasonal droughts occur; therefore, the EEP recommends continuation of drought studies on beans.

VII. COMMENTS ON THE EXTENSION PROPOSAL

The EEP recommends approval of the extension proposal.

1987 EEP REVIEW

NIGERIA/UNIVERSITY OF GEORGIA/McWatters

Appropriate Technology for Cowpea Preservation and Processing and a Study of Its Socio-Economic Impact on Rural Populations in Nigeria

I. PROGRESS

A. Specific Research Contributions

1. Research in process

a. Nigeria

(1) Socio-cultural factors: The storage, preparation and consumption of cowpeas and products made from cowpea paste and cowpea meal were studied in socio-economic/cultural surveys of 332 households in Anambra State. Though few cowpeas are grown there, they are imported by merchants from the north and virtually all families eat them at least twice a week. They are eaten as boiled peas, though steamed (moin-moin) and deep-fried (akara) paste are also important. The paste can be prepared from meal, and methods for dehulling the cowpeas and of preparing meals are now at pilot plant stage in a few areas and in a few commercial firms in the food industry.

(2) Nutrition, food preparation and health: Surveys of nutritional state and labor profiles show that labor requirements in other sectors of rural life-systems adversely affect the time available for child care in rural families and that (judged by height-for-weight) nearly 30 percent of the children are malnourished. Weaning foods made with cowpeas along with maize and rice may be as acceptable and effective as existing commercial cereal-based weaning foods.

It is well known that cowpeas (like many other legume and non-legume foods) can induce flatulence and internal discomfort. These appear to be lessened if hulls are removed or if the peas are cooked under pressure and to be removed if the peas are made into akara (at even hotter temperature). Cowpeas can be more easily dehulled if they are wetted and dried, and a similar but longer treatment ("germination") appears to lessen flatulence.

These results suggest lines of approach to the causes of flatulence and discomfort which ought to be followed.

(3) Many physical attributes of cowpea seeds, pastes and meals were investigated and measured.

(4) Storage: Dehulled and dried cowpeas can be safely stored in polythene bags.

b. United States

(1) Nutrition, food preparation and health: Methods of decortication affect the physical and functional characteristics of cowpea products; and moderate drying temperatures (50, 70° C) are more favorable than 110° C. Physical, structural and microbiological tests were made on cowpea pastes. The content of oligosaccharides was substantially lessened by wet conditioning ("germination") for up to 24 hours at 15° C or for 12 hours at 30° C, followed by incubation at the 30° C for 24 hours; and this lessened but did not remove flatulence. The treatments increased the amounts of some B vitamins but not of ascorbic acid and did not adversely affect the akara made from the meal.

(2) Storage: Meal prepared by milling dehulled seed can be stored in polythene bags at water potentials equivalent to 55 percent relative humidity at 21° C or at 18° C, without significant change. Meal stored at 37° C was less satisfactory in appearance and function.

2. Research results disseminated and in use

a. Improved cultivars, inoculants, tests, methods, etc.

Methods of dehulling cowpeas and of preparing, packing and storing cowpea meal have been brought to pilot stage in rural installations at Ogbodu-Aba in Anambra State and in the Africare project at Isiala-Ngwa in Imo State. They are also being used on a comparatively small industrial scale by two Nigerian food firms. Weaning foods developed by the project are prepared by the Africare child survival project at Isiala-Ngwa and in other intervention programs. The project has helped to promote initiatives in cowpea processing and in child care in rural communities. Numerous professional papers of different kinds on methods and tests have been produced both in the US and in Nigeria, but no bulletin or similar publication has been produced by the project or any other agency to help to transfer the results and methods to wider public use in Nigeria.

b. Evidence of extent of use

The methods developed by the project are in use in the two areas mentioned above and by two food companies in Nigeria,

one of which has produced 300 and the other 150 tons of meal so far. The methods of drying have been useful in the preparation of malt from sorghum for the brewing industry in Anambra.

3. Other research-related results

a. Germplasm conservation and use

(1) Domestic

Not applicable, but note that the project has not investigated differences between cultivars, or the effects of phenology, harvest time and season on the technical properties of cowpeas and cowpea products. The types of cowpeas used in the research in the HC and in the US are not specified in the reports.

(2) International

Not applicable

b. Seed production and distribution of CRSP-produced cultivars/materials

Not applicable to seeds, but meal produced and packed in the two pilot plants is distributed locally.

c. Impact of other CRSP-produced or -recommended technology

Methods and equipment for dehulling cowpeas and preparing and storing meal are in use at the two pilot plants and in two firms in the food industry in Nigeria.

d. Contributions to and participation in international bean/cowpea research networks

The project in the HC is associated with IITA-Ibadan and a paper was presented at the International Cowpea Conference there in 1984 (published 1985).

e. How research findings specifically address the needs of small-scale farmers and women

The project may support the further technical development of mechanized food processing both commercially and in the villages. This may be expected to lessen the amount of heavy routine manual labor which both rural and urban women have to apply to prepare food at present. This in turn should release time and labor for other and more productive tasks including the care of children. The weaning foods may help women to feed children better in both country and town.

B. Changes in National Production of Beans and Cowpeas in Host Country

Data for total pulses (almost all cowpeas) for Nigeria, FAO Production and Trade Yearbook 1986 (Vol. 40) and Trade Yearbook 1981 (Vol. 35)

	1979-81	1984	1985	1986
1. 1,000 hectares planted	1,462	1,320	1,420	2,270
2. Yields per hectare, kg	512	399	465	587
3. Total production, 1,000 tons	747	527	661	1,332
4. Net imports, 1,000 tons	/1	52	5	33
5. Total supply, 1,000 tons	747	579	666	1,365
6. Supply, g/head/day	25.6	17.2	19.2	37.9
7. Equivalent protein at 25% g/head/day	6.4	4.3	4.8	9.5

The variations with time are probably the result, in the main, of variations in weather between seasons.

C. Training

1. Numbers and kinds in process

   a. Nigeria--4 B.S. (E. N. Njoku, P. O. Ezimah, H. Ohajunwa and J. Anyika), 5 M.S. (V. O. Ndubuaku, J. I. Souzey, P. O. Ikeme, Mercy Mba and M. O. Audu) and 4 Ph.D. students (E. C. Okeke, J. N. Enwere [spent time at Athens, Georgia] and P. Okechukwu), all Nigerians, conducted projects at Nsukka using equipment and resources provided by the CRSP in 1987. None was paid any salary from CRSP funds.

   b. United States--1 US student (Marlene Bulgarelli) and 1 Nigerian student (Ifendu Nnanna) conducted research for Ph.D. and 1 Nigerian student (Theresa Damola) worked for the M.S.

2. Numbers and kinds completed

   Nigeria--Ada Uwaegbute completed the Ph.D. and M. E. Nwojo and Nkechinyere (Bridget) Onah completed the M.S. in 1987.

3. Cumulative training totals

   No data available for US. In HC, including those still in training, the project has provided facilities for the work of 33 B.S. students, 12 M.S. students and 5 Ph.D. students so far.

4. Project training targets during three-year extension period (1986-89)

   US--Bulgarelli, Nnanna and Dumola will complete at UGA in 1988; and training of 4 B.S., 5 M.S. and 4 Ph.D. students will continue at the University of Nigeria, Nsukka.

D. Institutional Development

1. Changes in 1987

Steady continuation along established lines, leading to commissioning and operation of pilot-scale village processing plants for cowpeas in two locations and to increasing industrial interest.

2. Over life of project

The project has substantially helped the departments of Food Science and Technology and of Home Science and Nutrition in the University of Nigeria, Nsukka, to become adequate and at least as good as any other similar university departments in Nigeria in respect to equipment and professional competence to provide instruction, research and advice for the region and the nation. It has also enabled them to associate technological, social and nutritional studies productively together.

3. In prospect

The departments are poised to spread their work and influence over many food commodities in addition to cowpeas. Where they will go and how fast will depend on their skill and success in attracting funds from other sources in addition to the CRSP.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

No audit or review is reported in the documents provided or was mentioned at Nsukka, nor, to the EEP's knowledge, has one been requested.

B. Adequacy of Funding

1. AID--The funding provided has substantially assured the success achieved so far by the project, which is in accordance with the log frame.

2. Host Country--The University of Nigeria, Nsukka, contributed a substantial sum (approximately 60,000 Nigerian naira) in 1982-3 and perhaps in later years also but presently is no longer able to offer more than support in kind--working space, academic and administrative support, and time of staff and students.

3. US university--Substantial and effective contribution in space, equipment, staff time and training.

C. Problems

US--Not known

HC--Transfer of funds to the University of Nigeria, Nsukka, through the Nigerian Embassy in Washington has proved difficult to track in Nigeria and generally cumbersome. It is suggested that funds be transferred directly in the future by a US bank to a Nigerian bank for payment into an account to be opened by the University especially for the purpose.

D. Adequacy of Current Policies and Procedures

In general, seems to be adequate, though it seems unlikely that any management analysis is done on the accounts.

III. PLANNING

A. Work Plan for 1987

Apparently prepared by the US and HC PIs and Professor Ngoddy. No information is given as to how or when prepared nor whether the budget and work plan are related.

B. Review of 1987 Work Plan During Implementation

The 1987 plans seem to have been carried out as intended without significant alteration. See sections IA1, 2 and 3; IB; IC and ID above for accomplishments and shortfalls.

C. Plans for 1988

1. Nigeria

a. Social studies to monitor effects in rural communities of technical methods developed by the project

b. Commissioning and operation, which will be closely monitored, of the village processing plant at Ogbodu-Aba

c. Widespread promotion of the methods developed by the project (but project has only very limited extension capability of its own and [apart from the cooperating Department of Agricultural Extension] will have to find other agencies to do most of the extension work)

d. Studies preparatory to the formation of a women's cooperative at Ogbodu-Aba to help women to market the products more effectively and profitably

e. Continued studies of nutritional state, regional variations, and effects of weaning foods and other products

f. Ergonomic energy (oxygen consumption) studies (though it is not clear what they will achieve for the purposes of the project that recording of time will not)

g. Field studies of flatulence (but how to distinguish between cowpea and other fermentable foods?)

h. Effects of storage under local conditions on technical properties of cowpea meal; physical and physico-chemical attributes of cowpea products

i. Modification of cowpea products with enzymes (though not clear what desirable modifications this is intended to achieve)

2. United States

a. Effects of wet tempering and drying of physical properties of pastes and of products made from them

b. Effects of hard-to-cook condition which develops during storage at warmer temperatures on processing and products, including digestibility (but nothing on the histology or cell and tissue level physics and chemistry of the hard-to-cook phenomenon in cowpeas or on variations between genotypes and between different pods on one plant)

c. Microbiology of pastes and effects of microbial action

3. Expected changes

No coherent information. By and large work in 1988 is intended to continue in most fields studied in 1987 but with more attention to application and utilization than to developing new procedures or products.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

Appropriate in areas of storage; nutrition, food preparation and health; and socio-cultural factors but do not seem to be sufficiently analytical in relation to flatulence, aesthetic and physiological acceptance of cowpea products, the nature of the hard-to-cook phenomenon (though this is proposed for 1989-92) or to genetic, agronomic and phenological diversity in the cowpea crop. In general, most of this program is built around the adaptation to cowpeas in Nigeria of methods in food technology which are already in use on other materials in other environments.

B. Balance between Research and Training

The training of HC nationals has been largely devised to produce a cadre of Nigerians to participate in the research and to strengthen the departments. Perhaps in the future more of them will go into other services and into industry to carry forward the work.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

The work in Georgia seems mostly to have been directed at adapting known methods to the preparation of foods from cowpea and to the study of the effects of storage. Within the range of constraints which the program addresses, the balance seems satisfactory.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

The collaboration between UGA and the University of Nigeria is close and mutually supportive, as between equals neither of whom is dependent on the other. Some of the logistic and communications difficulties which were so prominent a few years ago have been eased; and the participants seem to have become accustomed to the rest.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

UGA has helped the University of Nigeria to build up equipment, staff and professional effectiveness; and it has provided valuable support in testing and adapting technical methods. The University of Nigeria has picked up an increasing share of the action and is now well able to do a great deal on its own. The HC PI and his predecessor seem to get on very well.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

There is no AID Mission in Nigeria, but Ms. Keys McManus, who looks after AID matters in the Embassy in Lagos, is interested in the project, especially in those parts which affect children. She should receive reports and be invited to visit. Maybe she should visit UGA also when she is on leave in the US.

G. Domestic and International Linkages and Cooperation/Collaboration

Normal professional linkages in the US; in HC a wide range of linkages with rural communities, commercial companies, and State Ministries and with the US non-governmental aid agency, Africare. The University of Nigeria group cooperates well with IITA but could benefit more from the link in respect of genetically and agronomically diverse material of cowpeas. Greater coordination with the CRSP INCAP project could be beneficial.

H. Cost Effectiveness

Cannot assess this at UGA. At the University of Nigeria, a great deal seems to be achieved with modest resources.

I. Institutionalization of Host Country Component

The project is fully institutionalized in two strong and vigorous departments at the University of Nigeria and is fully supported by the Dean of the Faculty of Agriculture and the Vice Chancellor's office.

V. PUBLICATIONS

FY 87, US: seventeen publications, of which four were papers in refereed journals

HC: fifteen publications, of which five were papers in refereed journals and one was a general textbook on food science and technology which has no specific connection with the project

VI. OVERALL RATING: 1--Highly Satisfactory in relation to its modest accepted objectives, which are largely adaptive, applying existing knowledge, rather than analytical, developing essentially new knowledge; and in relation also to design and execution

VII. COMMENTS ON THE EXTENSION PROPOSAL

The EEP recommends approval of the extension proposal.

1987 EEP REVIEW

SENEGAL/UNIVERSITY OF CALIFORNIA-RIVERSIDE/Hall

A Program to Develop Improved Cowpea Cultivars, Management Methods and Storage Practices for Semiarid Zones

I. PROGRESS

A. Specific Research Contributions

1. Research in process

a. Senegal

Thirty standard ("mini-kit") trials on farms and by farmers were conducted in 1986 and thirty-five in 1987 in two arid zones of Northern Senegal. Both seasons were harsh. In 1986, on the average, the standard Bambey medium-season variety 58-57 once again yielded most, but the varieties Ndiambour and Mougne were as good or better in some trials and the shorter season forms B21, CB5 and TVx 3236 (cf Botswana) did well in some trials. The phenological-physiological reasons for these local successes would be of great interest.

As prices rose from a common low level around 60 CFA per kilo in October (soon after harvest), Mougne and Matam rose most rapidly and touched 120 CFA in June. Ndiambour, 58-57 and CB5 attracted smaller prices. Why? Are Mougne and Matam preferred simply for aesthetic and culinary reasons? Do they develop less of the hard-to-cook attribute? Do they store better?

Mixed cowpeas attracted the least price at all times and never exceeded 80 CFA per kilo. Does this mean that some cowpeas are grown mixed, and then separated for marketing, as at least some beans are in Malawi? Or is there some other reason--perhaps they are the sweepings of the merchant's store after peas less damaged in store have been removed?

All this indicates that we may not know enough about how cowpeas are grown in Senegal. The report suggests that they may, in fact, be grown as mixtures of types differing in phenological behavior; and indeed some simple agronomic experiments have demonstrated advantages of mixtures in Senegal (cf beans in Malawi and rice in Philippines, to name but two). Is it possible that mixtures are a widespread response to environmental diversity and uncertainty in tropical systems in which the profile may not hold a reserve of water (as it does in temperate-climate systems) and successive hand harvests are feasible?

These trials prove the superiority of 58-57, but they provoke many interesting questions to which it is hoped the team will be sensitive.

Storage in sealed drums was less uniformly successful than had been hoped. Work to find out why is in progress.

Breeding in Senegal suggests that it may be possible to produce disease- and insect-resistant or -tolerant forms with larger yield potential than 58-57.

Further studies were made of insect damage in the field and of bruchid attacks in store. Unfortunately, neem does not hold up to its reputation. Systematic studies of diseases were continued, including viruses and their transmission in seed (with IITA). Studies of weeds suggest, inter alia, that the root parasite Striga gesneriodes may be locally important and should certainly be watched carefully.

b. United States

Spacing studies at Riverside suggest that smaller-statured "early" varieties yield best at close spacing--not exactly a new result. Large harvest index in a botanically indeterminate crop indicates substantial priority for fruits over vegetative parts in the partitioning of dry matter and nitrogen during growth; and this in turn compels the plants to mature sooner because leaf area index falls and the crop becomes increasingly source-limited.

Breeding in California suggests that it may be possible to produce large-yielding "stay-green" types for Senegal--maybe, following what peanuts do, they branch rather more than those which do not stay green so long. At least we should know the morphological-biophysical reasons why. A large crossing program to combine these attributes with tolerance of heat and resistance to diseases was started at UCR. Six new advanced lines of vegetable cowpeas seem to be superior to six that were released as germplasm in 1986.

In the genetical work on heat tolerance, effects at early flower bud stage are now distinguishable from effects in the pre-anthesis/podset stages. The possibility of combining the two distinct resistances is being investigated.

Methods of selecting and combining putative morphological and physiological components of adaptation to dry conditions are being pursued, but the environments being studied are not described quantitatively in the report. It was not surprising that the fashionable biophysical attributes (allegedly measured with "the Li-Cor") had not proved useful in the search for adaptation to dry conditions. 13C discrimination

has been less useful than was hoped--perhaps because the plants have to get water before they can use it more efficiently.

The search for more effective fixation of nitrogen has encountered differences between lines which differ in time to maturity--maybe because they differ in the time course of the triple partition between fruits, vegetative parts and nodules. It may be that a useful start would be to screen for susceptibility to Rhizobium at 30 days after germination, before partitioning begins seriously to affect the number and activity of nodules.

2. Research results disseminated and in use

   a. Improved cultivars, inoculants, tests, methods, etc.

   The most striking achievement which this project can claim was based on the testing of diverse materials in Senegal. In 1985 a long-continued drought episode had led to poor cereal harvests in several years and famine threatened. With the help of USAID, the EEC and the CRSP project, the Government of Senegal imported and distributed some hundreds of tons of seed of California Blackeye 5. Since cowpea is botanically indeterminate, it can produce some sort of a crop even if the rains end early, which is more difficult for the determinate cereals. As a result, food was produced and famine was averted.

   Though it may be time for the CRSP to stop dining out on this achievement, CB5 continues to be grown by farmers in the more northerly regions. With the return of rather more favorable weather, satisfactory cereal and peanut crops have been harvested. Cowpeas have become less critical, and the longer-season local variety 58-57 has been used more in the wetter parts of northern Senegal.

   b. Evidence of extent of use

   The production data quoted below and on the evidence obtained from rural people in the surveys associated with the "on-farm mini-kit" trials

3. Other research-related results

   a. Germplasm conservation and use

      (1) Domestic

      The project does not seem to have made systematic collections of local cultivars in Senegal; but it has

assembled many hundreds of lines from Senegal and elsewhere, including what may be a complete set of the Botwana collection. No information on how the seeds are stored or conserved.

(2) International

It is intended to multiply these materials if funding permits and to send samples to the Regional Plant Introduction Station of USDA at Experiment, Georgia. Cowpea materials have been obtained from the Botswana CRSP project and from IITA as well as from California.

b. Seed production and distribution of CRSP-produced cultivars/materials

Three tons of foundation seed were produced in 1986 (varieties not named) and five hectares of seed fields were to be planted in 1987. The production is far short of the twenty tons of foundation seed required to produce four hundred tons of certified seed a year to meet the needs of the nation. This scale of operations might be thought to be beyond the responsibilities of the CRSP and may have to be funded in other ways.

c. Impact of other CRSP-produced or -recommended technology

Some of the methods tested by the CRSP and promoted in 1985 seem to be in use by farmers--quality seed, mechanized sowing (of denser populations in rows) and weeding by animal-drawn equipment. Farmers appear also to be interested in some of the newly tested local varieties (see above).

d. Contributions to and participation in international bean/cowpea research networks

Cooperation with IITA and with cowpea growers in California and Georgia

e. How research findings specifically address the needs of small-scale farmers and women

The role of CB5 and the project in averting famine in 1985 has been mentioned above.

The introduction of early varieties has led to increased consumption of fresh immature pods in the hungry gap period. No doubt the leaves are useful as well.

The "mini-kit" trials are associated with social surveys (directed to women as well as men in this Muslim society) which have illuminated the significance of early varieties for labor profiles.

B. Changes in National Production of Beans and Cowpeas in Host Country

Data for all Senegal from annual report of the Senegal/Hall project and FAO tables, estimated in some cases

		1979-81	1984	1985	1986
1.	1,000 hectares planted	52	53	121	118
2.	Yields per hectare, kg	398	303	546	466
3.	Total production, 1,000 tons	21	16	66	55
4.	Net imports, 1,000 tons	1	1	1	1
5.	Total supply, 1,000 tons	22	16	67	56
6.	Population, millions	5.66	6.35	6.44	6.62
7.	Supply per person per day, g	10.6	6.9	28.5	23.2
8.	Cowpea protein per person per day at 25%, g	2.6	1.7	7.1	5.8
9.	Total protein supply, g per day	67.2	61.7 (1983-5)		
10.	Plant protein supply, g per day	50.5	47.8 (1983-5)		
11.	Cowpea protein, % total protein	4	6		
12.	Cowpea protein, % plant protein	5	8		

C. Training

1. Numbers and kinds in process

Two Senegalese students, Samba Thiaw and Khady Diop, following courses for B.S.; one Sudanese has commenced study for a Ph.D.; Moses Kwapata from Malawi is working for a Ph.D.; and Kwaja Marfo from Ghana is working in a project for a Ph.D. of the University of Ghana, Legon--all at UCR.

Two US students are completing dissertation research at UCR.

2. Numbers and kinds completed

None completed in 1987.

3. Cumulative training totals

Ndiaga Cisse (Senegalese) obtained an M.S. in plant breeding at UC-Davis in 1982; Ibrahim Dow el Madina and Hassan el Owad (Sudanese) obtained M.S. and Ph.D. degrees respectively at UCR.

Seven US students have completed graduate degrees at UCR partially funded by the CRSP; two are working at IITA.

4. Project training targets during three-year extension period (1986-89)

No information

D. Institutional Development

1. Changes in 1987

Francois Faye replaced Mbaye Ndoye as Director of Crop Production in the Institut Senegalais de Recherches Agricoles (ISRA) and became acting HC PI of the project, and Amadou Bal replaced Mamadou Ndiaye as project coordinator and leader of the "mini-kit" experiments. Responsibility for the work on nitrogen fixation passed to Mamadou Gueye, and the research of Thiaka Diouf on physiology and agronomy was discontinued. Though the ISRA cowpea team is smaller, it is appropriate to the funds available and the most important field research continues. Naturally the US PI feels that it should be strengthened, but the Government of Senegal must set its own priorities, whatever we may think.

2. Over life of project

Though the US PI was involved with agronomic research in Senegal before the CRSP was set up, the CRSP has certainly helped ISRA to establish a significant indigenous structure for cowpea breeding and other aspects of research there.

3. In prospect

This turns on the funds available to ISRA and the priorities perceived by the government for agricultural development and research. Senegal has many other crops and farm systems to think about in addition to rainfed cowpeas.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

The US PI reports that information was provided for an intended audit of the ISRA component of the project, but no report has been received from the auditors or from Senegal about any visit by them. In 1987 ISRA informed him that a private firm had been hired to audit several ISRA projects including the CRSP. Relevant financial information was provided accordingly.

B. Adequacy of Funding

1. AID--The funds provided from the CRSP to the HC team were over-expended by October 1, 1986, and exhausted by April 30, 1987, apparently because the enthusiasm of the HC team outran their reasonable expectations. The consequence can only be to lessen the pace of the work and to transfer some of the activities to other external support. In the US, travel to Senegal had to be restricted and other funding found for training scholarships. Since the US PI cannot plan forward, the work of the project is inevitably hampered.

2. Host Country--The amount the HC is able to commit to cowpea research (and maybe to any research at all) is limited: such is the nature of under-development. In these circumstances, funding for any particular purpose is strongly influenced by external support, without which work may lose domestic support in competition with other purposes. We should not assume that cowpeas necessarily have the priority in the government's estimation that they have in ours.

3. US university--No information

C. Problems

See notes above.

D. Adequacy of Current Policies and Procedures

No further information

III. PLANNING

A. Work Plan for 1987

No specific information but apparently prepared by the US PI in consultation with Senegalese colleagues during their more or less annual visits to UCR.

B. Review of 1987 Work Plan During Implementation

Some reductions in activity must have followed the over-expenditures in Senegal, but the management details are not reported.

C. Plans for 1988

1. Research in Host Country and US

a. Senegal

Continue "mini-kit" program and test additional promising materials including products of breeding in California; examine relation between agronomic results and weather conditions; determine why storage in drums was not consistently effective; continue studies among farmers and rural people of their needs and their responses to new options offered by the project. Maybe it would be useful to find out what merchants think about cowpeas and the work of the program.

b. United States

Continue research and breeding on cowpea adaptation to hot temperatures; develop vegetable cowpeas; study methods for improving adaptation to dry conditions.

2. Expected changes/additions/deletions

No detailed information available, but it is evident that the program has had to be restricted for lack of funds in both the HC and the US.

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

The activities are appropriate to the attempt to lessen constraints due to environmental difficulties and to weaknesses in storage; and socio-economic matters are studied as a means to making the research more relevant to the resources and purposes of producers.

B. Balance between Research and Training

Though it has trained a number of US nationals, this project has trained few Senegalese. In part, this is because few Senegalese are regarded as competent to start on graduate training when they come to California; two have had to start on B.S. courses. They also have difficulties with the English language--though most of them speak English far better than most English speakers speak French; and they are all happy to learn more English. Overseas training outside the French sphere of influence does not readily fit into the educational and professional structures of Senegal and ISRA; training in the French system is more useful in this regard.

It is possible that if the CRSP is to continue, cooperation with CIRAD or ORSTOM would find ways of combining what the CRSP can offer in training with the structure of the French system.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

Satisfactory. For the most part, what is appropriate to be done in Senegal or California is done there. The EEP is still not certain, however, that the dry conditions, adaptation to which is studied in California, correspond at all to the dry conditions of Senegal. This comment does not affect the studies of adaptation to hot temperatures or detract from the view that the two sets of activities are mutually complementary and supportive.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Cooperation between UCR and ISRA seems to be satisfactory and fully adequate for the purposes of the project.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

One who has not visited Senegal to see what is done there cannot fairly answer this one. The reviewer's subjective assessment is that the dominant influence is that of the US PI; apart from his personal qualities, he has both the money and the experience. But it is also evident that the Senegalese team is pulling its weight and managing its part of the project well and that the two parts of the project are well linked together, as has been said above. The reports from Senegal are professionally satisfactory.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

Reported to be positive

G. Domestic and International Linkages and Cooperation/Collaboration

Senegal: The reports suggest that the sole linkage within Senegal is with ISRA, but it is possible that ISRA in its turn has links with other agencies of the Government of Senegal and with the University Cheick Anta Diop of Dakar (formerly the University of Dakar) and technical training institutions in agricultural science and technology. This should be explored.

H. Cost Effectiveness

Not covered

I. Institutionalization of Host Country Component

See response to ID above. The project is embedded in ISRA, but how deeply will depend, at least in part, on the continuance of external support.

V. PUBLICATIONS

In FY 87, HC: nine reports within ISRA, one manuscript report at Riverside, one paper listed by IITA staff in a refereed journal

US: four research papers and conference proceedings, three papers in refereed journals

VI. OVERALL RATING: 1--Highly Satisfactory

VII. COMMENTS ON THE EXTENSION PROPOSAL

The EEP recommends approval of the extension proposal.

1987 EEP REVIEW

TANZANIA/WASHINGTON STATE UNIVERSITY/Silbernagel

Breeding Beans (Phaseolus vulgaris L.) for Disease, Insect and Stress Resistance and Determination of Socio-Economic Impact on Smallholder Farm Families

I. PROGRESS

A. Specific Research Contributions

1. Research in process

This project has two related but different parts. It is intended (a) to select lines of beans which are resistant to two or more of the common diseases of beans in Tanzania, bean common mosaic virus (BCMV), halo blight (HB), angular leaf spot (ALS) and bean rust; and (b) to conduct socio-economic studies to describe the place of beans in rural human life systems of different kinds in Tanzania and the effects on them of new materials and methods developed by the project. The study of the technical aspects of existing systems of bean production and of the types of beans used in them does not necessarily form part of the project.

a. Tanzania

The main materials provided for review, apart from reports by the HC and US PIs, are the reports of the fifth and sixth bean workshops held at Sokoine University of Agriculture in 1986 and 1987 and the 1988 EEP review in Tanzania. These workshops are now established as an important regular event in East Africa.

The first report is a professionally worthy document, but the second leaves much to be desired. In many of the papers in it, tables essential to the understanding of the results, such as tables of mean yields, are mentioned in text but are omitted, even though the conclusions are reported as established facts; some tables report dubious data or contain apparently important differences which are not explained; some of the experimental designs are inappropriate; much play is made with significance of (often unreported) differences or of elements of variance, forgetting that the important thing about a difference is not its significance but its size. This is not the place to review this set of reports in detail, but the two PIs should review it before it is published, in order to ensure that it is a worthy successor to the 1986 report.

A very wide range of materials were screened for resistance to diseases. It included 122 hybrid lines from Prosser, WA; lines from CIAT; and the progeny of crosses between locally

adapted large-yielding lines and known sources of resistance. Numerous lines were found to be resistant to two or more diseases.

With the departure of Dr. Karel at the end of his contract, entomological work had to be suspended; but it should revive with the help of Dr. J. G. Yarrow from the University of Dar es Salaam. Breeding work should be strengthened by the participation of Dr. O. D. Mwandemele, also from Dar es Salaam.

It is stated that inoculation with Rhizobium doubled yields even in very poor soils, but the report from the 1987 workshop omits the essential table of yields. Nevertheless, inoculants are being increased for sale to farmers--though by what means is not clear. This project should continue to ensure that whatever researchers and governments may wish to do about inoculation in the field, researchers also search for lines which are good at fixing nitrogen with indigenous Rhizobium. The EEP review suggests that this line of research has enormous potential.

A good deal of work is reported on "drought resistance" but few data are presented. Measurements were made of stomatal resistance, electrical conductivity (whether tissue or sap is not clear) and relative water content, but no data are offered and the general statements made about significances from analyses of variance cannot be examined.

Lines vary in cooking time (though nothing is said about preceding conditions of storage). A human-powered thresher was built but needs further modification.

Promising lines have been used in various agronomic trials, but the yield data are either not given or are inconsistent; and the correlations quoted between measured attributes or components are not a satisfying substitute. What could be an important paper on the effects of intercropping on disease in different varieties is presented without hard data, even though the test suggests, and indeed claims, some biologically and agronomically important results.

The studies of the system for releasing and distributing beans in Tanzania is a warning to the CRSP not to expect that breeding can rapidly transform the situation there. One of the constraints may well be market demand, which is being studied in the Morogoro region. An interesting comparative study is reported of output and nutritonal levels in Lushoto and Korogwe.

The breeding program of this project is rated excellent both in Tanzania and at Washington State University. Leadership at both sites is outstanding.

b. United States

Most valuable supporting work was done at Prosser. About 1000 lines from Tanzania and the US were screened with races of BCMV and HB. Lines which tolerate heat, cold and drought have been identified (the screening methods are not given but are said to be under improvement) and crossed with disease resistant materials. The possible use of monoclonal antibodies in the field to identify BCMV strains is being studied.

2. Research results disseminated and in use

There is no evidence that any product of this project is being used by farmers or persons other than research workers in Tanzania. No CRSP-produced cultivar has yet been ready for distribution. The report of the HC PI refers to (a) improved management practices including dates of planting and bean populations, which we must take to be no more than research results; (b) six promising bean lines which are being multiplied for multi-locational testing; (c) inoculants being produced in a pilot project and sold to farmers at a nominal cost of T. Sh. 50 (for how much inoculant, to how many farmers, where?); (d) the need to extend the use of neem extracts and oils to control bruchids; (e) the workshops, which are not attended by farmers; (f) a bean production manual in preparation; and (g) a great demand for the publications by Dr. Due and others on farming systems in Morogoro and Tanga.

3. Other research-related results

a. Germplasm conservation and use

Considerable exchange and evaluation of genetic materials occurs, but there is no reference in the reports to systematic documentation of the attributes of accessions or to conservation. Sokoine University of Agriculture is said to have blueprints for a seed storage and research facility but no money with which to build it; and it is not clear whether it will include facilities for longer-term conservation.

b. Seed production and distribution of CRSP-produced cultivars/materials

No CRSP-produced cultivar is yet ready for distribution.

c. Impact of other CRSP-produced or -recommended technology

See above.

d. Contributions to and participation in international bean/cowpea research networks

Cooperation within the profession with CIAT and with bean research workers in North America seems to be active and effective, and the Tanzania project has built up a large, informal East African network of bean researchers, mainly through the annual meetings at Morogoro and the personal contacts to which they lead.

e. How research findings specifically address the needs of small-scale farmers and women

The social science studies are intended specifically to do this; and they appear to do so, though it is evident that so far there has been no real meeting of minds between the natural science/technical participants and the human science workers. For this, it may be necessary to persuade the former that there are social as well as natural environmental resources and constraints that determine what farmers do and what research workers can do to help them to do it better; and the latter that there are technical and scientific, as well as social, reasons for farmers' practices which offer a fascinating field for research. See also comments on indigenous and imported agricultural knowledge in the reports on visits to Malawi and Nigeria.

B. Changes in National Production of Beans and Cowpeas in Host Country

Data from FAO Production and Trade Yearbooks of appropriate years (Many values are evidently estimates, though checked with GOT)

		1979-81	1984	1985	1986
1.	1,000 hectares planted	500	447	450	450
2.	Yields per hectare, kg	502	627	627	627
3.	Total production, 1,000 tons	251	280	282	282
4.	Net imports, 1,000 tons (all pulses; - = export)	-27	-6	1	-9
5.	Assumed total supply (taking all imports or exports as beans	224	274	283	273
6.	Population, millions	18.9	21.7	22.5	23.3
7.	Beans per head, g/day	32.5	34.6	34.5	32.1
8.	Bean protein per head at 25%, g/day	8.1	8.3	8.3	8.0
9.	Total protein, g/day	52.6	52.2 (1983-5)		
10.	Plant protein, g/day	42.1	42.4 (1983-5)		
11.	Bean protein, % total	15	16		
12.	Bean protein, % plant protein	19	20		

Bean protein appears to provide about one-sixth of total protein and about one-fifth of plant protein, much of which must come from cereals. Animal protein constitute about one-fifth of total protein. These

data do not include unrecorded sources such as wild animals and the leaves of wild and cultivated plants.

C. Training

1. Numbers and kinds in process

Mr. P. R. Dimoso is working for an M.S. at the University of Birmingham, but it is not clear with what funding (could be IBPGR). Ms. Martha Quentin is still in training at MSU (Ph.D. in entomology); Ms. Susan Nchimbi completed an M.S. in plant breeding at Wisconsin and has nearly completed her Ph.D.; Mr. Robert Mabagala has completed an M.S. and the course work requirements for a Ph.D. in plant pathology (bacteriology) at MSU and he plans to conduct his thesis research in Tanzania; Mr. Naftali Mollel has completed an M.S. in agricultural extension at the University of Illinois and plans to go on to a Ph.D. in Kenya; and Mr. Flavius Magayana is engaged on a one-year research assistantship at the University of Illinois, where he will follow courses toward an M.S. in agricultural extension.

2. Numbers and kinds completed

Dr. Rugambisa completed a Ph.D. at the University of Illinois and is now back at SUA.

3. Cumulative training totals

1 Ph.D. completed; 4 M.S. completed, candidates proceeding to Ph.D.; 2 M.S. in progress

4. Project training targets during three-year extension period (1986-89)

None specifically reported. During 1988-89 SUA proposes to admit students to M.S. courses at Morogoro, which will strengthen the University and the work on beans and cost far less than sending students abroad. Other purposes are short-term training of technicians and of a computer operator and continued support for the four students working for Ph.D. in the United States.

D. Institutional Development

1. Changes in 1987

Changes in senior staff have been mentioned above.

2. Over life of project

A measure of capability in research on beans has been built up at Morogoro and in the University of Dar es Salaam. It has suffered from staff changes and from the fact that none of the

senior members is able to devote more than a part of limited research time to beans. Prospects for the future are promising, given continuation of present leadership. The HC PI is an impressive professional. He is ably supported by a high quality staff.

The official agencies for bean research in Tanzania are the Tanganyika Agricultural Research Organization (TARO) and the Uyole Agricultural Centre (UAC). The project has enabled the University to bring staff members from these agencies together, but it is not clear to the EEP that an agreed unified national program of bean research has emerged officially.

Whatever is done practically as a result, except perhaps in the Southern Province where UAC seems to have developmental as well as research functions, will have to be done through the Ministry of Agriculture. The Ministry is concerned with seed multiplication and can influence extension, which is (or was) carried out by provincial administrations under the authority of the Office of the Prime Minister.

3. In prospect

The EEP sees no reason to expect that SUA will in the near future be able to accelerate and expand bean research without a measure of external support and professional collaboration. So, though the project can be said to be institutionalized, the institution itself is not strong.

II. FUNDING/FISCAL MANAGEMENT

A. Audit/Project Management Reviews

Monthly statements with receipts are sent from SUA to Washington State University. The Tanzania Audit Corporation, as official auditor to SUA, audits all University accounts regularly.

B. Adequacy of Funding

1. AID--US PI reports that decreases in funding by AID mean that some critical needs in the HC may not be met; that maintenance and repairs of equipment may not be possible there; that international travel has been eliminated for HC cooperators; that technicians and other auxiliaries are not being trained; and that graduate students will no longer come to the US for training. The program has become concentrated on breeding for disease resistance and on the studies of smallholder families, especially on the role of women. BNF, cooking, threshing and agronomy now have far lower priority than before.

In the US, the budget has been cut to a limit below which it may not be worthwhile to continue. Travel of US scientists and administrators, both very desirable for efficient working, is limited. The rate of progress in the trail-blazing work with monoclonal antibodies for the characterization of strains of BCMV (important for US bean growers as well as producers in many developing nations) has been reduced.

2. Host Country--No information

3. US university--No information

C. Problems

Nothing new to add that has not been said before or above.

D. Adequacy of Current Policies and Procedures

No new information

III. PLANNING

A. Work Plan for 1987

Seemingly prepared by the HC and US PIs in consultation, but no specific information

B. Review of 1987 Work Plan During Implementation

No information

C. Plans for 1988

1. Research in Host Country and US

In both, program for 1988 represents orderly continuation of work in 1987, except that no new training will be undertaken in the US. Training will be developed at Morogoro instead.

2. Expected changes/additions/deletions

See above

IV. STATUS

A. Appropriateness of Activities to Goals of Global Plan

The activities of the project are appropriate to the alleviation of constraints due to pests and disease; and they also address the socio-economic environments in which beans are produced and consumed in Tanzania. Work on customary or improved production methods and on post-harvest questions and utilization takes a second place.

B. Balance between Research and Training

Satisfactory professionally; a small but strategically appropriate cadre of graduates has now been trained or is in training. But this has consumed a disproportionate part of a restricted budget, particularly as SUA has always been determined that the students shall complete their studies, whatever the consequences for the bean research.

C. Balance of Domestic vs Overseas Activities with Respect to Program Constraints

The US and HC activities in pathology, breeding and social studies are mutually appropriate or complementary and well articulated. There is no entomology in the program in the US.

D. Level of Collaboration/Cooperation between US and Host Country Institutions and Personnel

Collaboration and cooperation seem to be not only adequate but excellent and rewarding. However, the links between the natural science and human science parts of the project are not as close as they could be for mutual support and benefit.

E. Relative Contributions of Collaborating Institutions and Individuals Towards Accomplishment of Objectives

The division of professional labor between US and HC institutions is described in detail in the report of the US PI on 1987. Hitherto, much of the impetus appears to have come from the US collaborators. Initially, at Sokoine, the participation of many University staff members seemed to be nominal. Now they are active participants, particularly in breeding and in plant pathology and the study of bean rust. This collaboration is the major strength of this CRSP.

An important contribution of the University has been in student manpower for short-term projects. The long-term commitment of senior members is not always necessarily assured. The reports also suggest that collaboration between Sokoine University of Agriculture, the University of Dar es Salaam, Tanganyika Agricultural Research Organization and Uyole Agricultural Centre is more productive than it has been.

F. Interest, Involvement and Support of USAID Mission and/or US Embassy

The USAID Mission in Dar es Salaam has always supported the project; and, with the increase in AID funds for Tanzania, it may be that activities downstream from the project itself, in the direction of farmers, can be supported from the AID program in Tanzania.

G. Domestic and International Linkages and Cooperation/Collaboration

The US participants are fully linked into their professional worlds in the US. The relations between institutions in Tanzania are considered above. A new element in the scene is CIAT, in its role as coordinator of bean research in the SADCC nations, which include Tanzania. CIAT has nominally to work with the national programs under SADCC's authority, and its link with the CRSP through the TC will in Tanzania be paralleled by a link through the national agency, TARO. All this could become very complicated, bureaucratic and time consuming.

H. Cost Effectiveness

Developmentally there is not yet anything to show for the cost in Tanzania except for greater capability in the University. In the US it may be that the germplasm resources and the new race screening methods of BCMV can be regarded as valuable products.

I. Institutionalization of Host Country Component

See ID above. The work on beans and their social relations is well institutionalized, but the institution itself is not strong. It is seriously underfunded and does not have a tradition of substantial, consistent, continuing personal or departmental research. It has lost valued senior staff. A strong external funding source could attract workers and students into other fields without any difficulty.

V. PUBLICATIONS

In 1987, US: ten publications, of which four were in refereed journals
HC: nine publications, two submitted to refereed journals

VI. OVERALL RATING: 1--Highly Satisfactory

VII. COMMENTS ON THE EXTENSION PROPOSAL

An EEP field review of this project in Tanzania appraised the breeding component of this project as excellent, with leadership by highly capable PIs supported strongly and effectively by a sizeable joint team of researchers in Tanzania and Washington State University.

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RESPONSE TO FY 86 AND FY 87 EXTERNAL EVALUATION PANEL RECOMMENDATIONS

MO AND GENERAL PROGRAM

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
1. The present mode of funding by the US Government inevitably leads to difficulty in planning and maintaining continuity in both research and training and materially reduces cost effectiveness. The EEP recommends that a system of three-year forward funding, as provided by CRSP Guidelines, be instituted to minimize these difficulties.	1. Issues regarding forward-funding are A.I.D. jurisdiction. To help support A.I.D. address this issue, we joined the other CRSPs and NASULGC in making this issue known to Congress through a joint formal briefing held in Washington.
2. The EEP . . . suggests that CRSP authorities review project personnel rosters, both in the US and in Host Countries, relative to project requirements.	2. Process of yearly updating of project US and HC rosters as part of the annual report was instituted. Roster review now is a part of the review--by the MO, TC and BOD--of the annual reports, which also include the workplans and budgets.
3. The EEP requests the Board of Directors and Management Entity to consider whether the MO's and the TC's responsibilities would not be more effectively discharged if members of the MO and TC were enabled to visit overseas and domestic locations more frequently than has been possible in the past two years. The EEP feels that the MO and TC require more funds to enable them to perform their duties effectively.	3. TC travel budgets were increased to allow appropriate project monitoring. The MO increased its travel somewhat with a firm eye on the 20 percent restriction indicated in the grant and a concern for the severe reductions in projects' research and training funds. For the TC, A. E. Hall visited Cameroon in November 1986 to assist in the redesign of this project and networking with the Senegal project. The TC also requested A. E. Hall to visit Botswana with an MO representative in September 1987 to assist with the redesign of that project. The TC recommended that TC members and other PIs and Co-PIs be provided travel funds for special visits that can contribute to the redesign and networking of projects prior to the development of extension proposals for the third phase of the CRSP. General travel to permit TC members to better understand other projects was not recommended by the TC for the following reasons: this would take time of TC members and personnel of the projects visited which the TC would prefer be devoted to research, and USAID Missions may be disturbed by visits that do not have an obvious purpose of high priority.

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
4. The ME should look into opportunities for increasing the efficiency of the MO by expanding its electronic capabilities for handling data and communications.	4. The MO investigated possibilities and presented its electronic equipment upgrade proposal to the BOD in line with the limited MO budget. Following BOD approval, new word processing equipment purchase requests were submitted and approved by A.I.D. The new equipment, installed in the MO in May 1988, will greatly increase MO capability to handle word processing and communications. The MO routinely uses electronic mail to communicate with A.I.D. and BOD members (BITNET, Dialcom, RCA Global).
5. A number of significant topics appear to require particular attention by all projects in the future. They are:	
A. The study and design of procedures and protocols in each project for transferring practical useful results to farmers and others who wish to use them, through the institutions and processes actually available or in prospect in the HCs.	5A. The issue of extension participation by CRSP research projects has had representatives from Washington on both sides. Similarly to what was agreed to by most CRSP people at an S&T workshop in Virginia, July 1987, this MO has encouraged CRSP participation up to and including on-farm trials and the preparation of technology for extension (e.g., mini-kits in the Senegal project). We encourage outside support for activity beyond this point. To that end, the MO submitted a proposal for non-CRSP A.I.D. funds to help build research-extension linkages (see CROP proposal). The Chair of the TC was consulted to make sure the proposal fit the wide range of national and subject matter contexts of the projects. No indication of support for this proposal has been received.
B. In particular, in all projects which include crop improvement, the development, by appropriate agencies in the nation, of procedures to multiply and certify seed and other planting materials and distribute them to growers.	5B. Same as 5A. CROP proposal allowed for linkage with, and reinforcement of, certain seed programs.

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
C. The description, evaluation, documentation and conservation of plant genetic resources, in cooperation with national authorities and international centers, including IBPGR.	5C. Activities in the Botswana project, now being phased out, included cowpea description, screening, cataloging and conservation, partially in cooperation with IITA. Materials identified have been made available to IITA and the CRSP Senegal project, whose PI is investigating conservation of all of the CRSP-identified cowpea germplasm in the Regional Plant Introduction Station at Experiment, Georgia. For beans, the major attention to diversity is done in the Malawi project although other CRSP projects also include such work. Coordination of these efforts is being planned in the Fall 1988 Malawi workshop for Eastern and Southern Africa (see proposal entitled Germplasm Conservation and Use: A Workshop on Genetic Diversity in Beans (Phaseolus vulgaris L.). This workshop is receiving multi-donor funding including some support from the Malawi Ministry of Agriculture. The CRSP is making progress in the conservation of germplasm through a new cooperative project between USDA and a CRSP project to transfer all cowpea germplasm to the US Plant Introduction System, and individual projects have transferred germplasm to IITA and CIAT.
D. The establishment of working links between projects which share interests in particular topics such as biological nitrogen fixation; the hard-to-cook phenomenon in legume seeds; other aspects of food technologies; multiple resistances to plant diseases; water relations and adaptations to dry conditions; and socio-economic and socio-technical studies.	5D. During the CG Centers Week, Barnes-McConnell talked with IBPGR Director about cooperation and followed up with a letter. There has been no response to date. In addition to the above, more has been done regarding intra-CRSP project linkages. For example, the TC has discussed the possibility of bringing together the CRSP Minnesota work now a part of the MSU/Mexico project with the new BNF project when it evolves. The recent return of Dr. Susan Nchimbi to Tanzania and earlier Dr. Juan Carlos Rosas to Honduras is strengthening HC capacity in BNF which will have a link to this US group. The Nutrition/Bean Quality CRSP Summer Workshop held at Washington State University was organ-

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
	ized to better link the two food science projects in the CRSP. However, because only a Nigerian student from UGA was able to attend, it served to establish stronger links with outside groups (e.g., CIAT) than with projects internal to the CRSP. Another smaller recent workshop on the hard-to-cook phenomenon in cowpeas held in Nashville by the UGA team, four persons from the WSU project were able to attend. The most effective medium for better integration has been the CRSP-wide PIs meeting. The one held in January 1986 brought together researchers from the same professional areas to consider the state of accomplishments, as well as provided a forum for discussions across constraint areas. The Global Plan and Progress Report was the result of that effort. The CRSP may be able to afford another such meeting the year after the BOD's IR meeting in Africa next year. The establishment of working links between CRSP projects is viewed as critical to progress in achieving goals on a broader, more global basis. The present bilateral funding structure does not promote interactions among projects. The TC recently has facilitated the establishment of links by providing funds to permit scientists from different projects to conduct joint analysis and planning (e.g., Malawi project representative participating in Tanzania project workshop). Strong linkages have been developed involving the exchange and mutual evaluation of germplasm. Provision of funds to either the TC or the MO for funding interaction among projects is viewed as being desirable.
6. The CRSP, which is and must continue to be concerned with cooperative research and the strengthening of national research systems on beans and cowpeas, will need to strengthen its associations with AID at all levels from the USAID Missions to AID/Washington.	6. The CRSP is in touch with its A.I.D. Program Officer several times a week and sends copies of all relevant communications to him. In addition, we attempt to meet all requests from Washington by the deadline given. The CRSP has been especially concerned with

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
	strengthening its association with USAID Missions. All CRSP personnel are strongly encouraged to hold briefing and debriefing meetings with USAID officials when visiting their HCs. To further strengthen these associations, USAID officials are invited to the CRSP Regional Review, Evaluation and Planning meetings held in their region (see Summary Report of Costa Rica Meeting). Although the LAC Bureau was very supportive, the USAID response was not strong. Hopefully, the African meeting being planned for 1989 will be more successful in this regard.
7. The EEP strongly encourages the PIs to include gender considerations in their proposals where appropriate.	7. The WID Specialist is now only half-time and must divide that time among all the projects. Her scope-of-work prioritizes her efforts and concentrates on those projects where the WID perspective is most appropriate (see WID material). Her work in Malawi (the remaining half-time) is expected to be an excellent demonstration of the WID contribution to production agriculture.
8. . . . the BOD may wish to determine if personnel and funding reductions have compromised the ability of the ME/MO to monitor and supervise projects and to promote and pursue buy-in opportunities at the country-Mission level.	8. The BOD considered the impact of the budget and personnel reductions on the MO and determined it reasonable to increase the MO to 3.65 FTE at least. That is, the Program Secretary and Administrative Assistant at 1.0 FTE each (rather than a .9 FTE), the Director at .9 and the Deputy Director at .75 (down from .85) would be the regular office FTE. This change will be of considerable help. While our travel budget is restricted, the MO attempts to meet with other Missions in the area of its international travel (e.g., Barnes-McConnell met with Zimbabwe USAID and MOA officials on the way home from Tanzania to discuss a training buy-in, which was well received).

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
9. The recent performance of the TC has been impressive and overall planning within the CRSP has improved; however, a major CRSP-wide shortcoming has been a perceived failure to review/adjust projects in the context of prevailing conditions in the countries in which the projects operate. This shortcoming relates to inability of the TC to travel and to limitations on the MO to travel.	9. The TC and MO have increased their on-site monitoring in line with budget, personnel and professional restrictions (see Travel Report and MO Travel Board and #3 above).
10. In general, the MO feels that because the CRSP is a research grant, the emphasis should be on journal articles. However, others feel that there are some areas where the MO is the most appropriate entity to publish. It is suggested that the MO, the TC and/or the BOD consider this issue.	10. With the decrease in MO size and the demanding joint appointments of the persons who are there, writing in the MO has been greatly reduced. With the BOD's encouragement, a technical book is being planned, and an author identified, which will present the research output of the CRSP in book form. The TC considers that the publication record of the Bean/Cowpea CRSP is excellent and that it should and does serve many different audiences and users. Insufficient technical information is being provided in A.I.D. publications and the TC has advised the MO that Research Highlights should be published and made available for broader circulation by A.I.D.
11. Staff in the MO are a well-organized team and all are enthusiastic in their work. They are to be commended for being able to conduct the affairs of a large and complex CRSP with a minimum staff and a meager use of project funds. This undoubtedly reflects the professional capacity and training of the Director. Nevertheless, the BOD and the ME may wish to consider augmenting the number of FTEs in the office slightly to make it more efficient and allow more time for forward planning. The MO may decide to carry out some studies such as the nature of publications coming from the CRSP and whether people trained by the CRSP are staying with their home institutions. Either the TC should be increasing their travel or travel funds	11. See #8 above. Forward planning is a significant concern. To be done well, it requires a great deal of analyses of present trends, resources and constraints as well as projections of same for the future. Without thorough preparation for such a task, the exercise can be a waste of time. The time available to the staff to prepare for this type of analysis is limited because of the reduction in the MO staff requiring everyone to spend their time meeting more pressing day-to-day needs. We have done as much of this preparation as possible and then turned our attention to organizing it in clear, readable form for the management advisory groups. Their input using these materials has been most helpful, especially as we have

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
shifted from their budget to the MO budget so that needed travel can be done by that office.	worked together for the next extension request. The evolving extension proposal is a result of all these efforts.
12. The EEP suggests that the TC should review the publication record of the CRSP to determine the extent to which the publications are appropriate to the prospective audiences and users.	12. Aside from the publications of the individual scientists generated by their respective CRSP research, there are technical publications of others to which they contribute. For example, an excellent publication by Paul Gepts (in consultation with Fred Bliss), Genetic Resources, Domestication, and Evolution of Phaseolus Beans, with a number of CRSP contributors, should be out soon. Also, see #10. The TC considers that only a modest level of publications by the MO is needed, including Pulse Beat, to maintain communication among the people within the CRSP network, and Research Highlights, in which the MO would help CRSP scientists to publish applied research of interest to scientists within the global network. The bulk of publication efforts should be the responsibility of project scientists and involve conventional scientific publications and annual reports.

BOTSWANA/COLORADO STATE UNIVERSITY

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
Transfers of responsibilities for research in Botswana have been made. Of the two M.S. degree students to return to Botswana, one is expected to become the Host Country Principal Investigator for the project. In the interim, arrangements were made for a US Peace Corps volunteer to manage the project. The TC and MO/ME may wish to determine if this arrangement is appropriate. Plans are underway for the US PI to spend two months each year in Botswana to assist with continued improvement of cowpea research and development. This arrangement should be reviewed and approved by the TC and the MO.	It was determined that yearly visits by the US PI would be appropriate. Hall and Barnes-McConnell made a site review of the Botswana project and negotiated an appropriate phaseout plan subsequently approved by the BOD. The Peace Corps Volunteer carried out transition research, worked with the new female HC PI as she moved into leadership role, and then enrolled in Michigan State University for Masters work in Plant Pathology. The US PI, who encouraged his wife's enrollment in the Ph.D. program in California, took early retirement from CSU and moved to California to work with Hall

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATION
Prospects for satisfactory continuation of this CRSP project appear uncertain and suspect, given the inexperience of current and prospective Botswana personnel; the general lack of necessary arrangements, facilities and infrastructure for the conduct of reliable agricultural research; and the likely inability of the GOB to provide adequate financial support. Credit must be given to the CRSP and the GOB for their efforts to make the best of a difficult situation, but their efforts probably cannot take the place of more promising options.	and the Senegal project, bringing duplicates of the Botswana germplasm collection with him.
Botswana is a prime site for the INTSORMIL CRSP. Under further budget reductions, an arrangement whereby the two CRSPs jointly support resident US scientists in Botswana may be a way to sustain and build on the investment and progress made in Botswana with sorghum and cowpeas. Any such arrangement should be in accordance with the priorities of the GOB and should be associated with the regional SADCC research coordination program.	The UCR/Senegal project has proposed, as part of the FY 88 Plan of Work, that disease-free seed from Botswana and Senegal collections would be increased in a greenhouse and then a farm of the University of California-Riverside and provided to the USDA Plant Introduction Station at Experiment, Georgia. The TC endorsed this proposal which would insure that cowpea germplasm collected by the CRSP is stored safely and made available to scientists in the US and overseas. The budget reductions hit all of the projects so severely that the Botswana funds were quickly redistributed, and there was only a very small amount maintained for the orderly phaseout.
It is recommended that the Technical Committee and Management Office review this project with special regard to plans and prospects, including role of Colorado State University, and report their findings to the Board of Directors for final review and disposition. Any future activity in Botswana should be developed in the light of the results of farming system research in Botswana by the team led by David Norman and colleagues.	Discussions with the Mission project there determined that they were prepared to full integrate the cowpea on-farm work with their farming systems project (ATIP). The MO has communicated with CSU regarding a close-out of the Botswana and CSU accounts. The CSU IR is presently on the BOD, serving as BOD Secretary.
With the departure of the US PI from Botswana, adequate maintenance of the Botswana Cowpea Germplasm Collection should be a matter of concern. The GOB should be encouraged to continue its present practice of insuring the safe, long-term storage of cowpea material collected in Botswana.	
FY 87 RECOMMENDATIONS	
None, since project is moving to its close as of 09/30/88	

BRAZIL/UNIVERSITY OF WISCONSIN

FY 86 RECOMMENDATIONS

The EEP recommends that means be sought to enable Dr. Bliss to contribute to the work on biological nitrogen fixation in any projects in the CRSP.

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Bliss portion:
The HC researchers, Araujo and Pereira, are CNPAF permanent staff. However, CNPAF is urged to assign a physiologist/ agronomist to the project and co-opt the support personnel currently carried by the CRSP project after its termination.

Maxwell portion:
The EEP believes the project has largely accomplished its stated goal in developing disease resistance (MDR) bean breeding and can be phased out at the end of the present grant period. However, there remains the unfinished molelcular biology studies on BGMV, a singularly complex pathogen. Therefore, the EEP concurs with the recommendation of the TC in completing the DNA characterization and developing of DNA probes--within a reasonable period of time--and preferably in collaboration with another CRSP project, like the DR/University of Nebraska.

RESPONSE TO RECOMMENDATIONS

Bliss portion:
Dr. Pereira has returned as the HC PI and head of the BNF work at CNPAF. Having done his Ph.D. under Dr. Bliss, he is prepared for this role. The GOB is so pleased with the work they have committed to assuming the salaries of the CRSP researcher at the end of this extension period. Dr. Bliss has expressed an interest in continuing to contribute to the CRSP. However, because of the heavy administrative requirements (e.g., unlike when he works for CIAT, he must request and wait for travel clearances, wait for approvals for important equipment purchases in HC) which goes with it, he does not wish to be a PI. Moving to an endowed chair at UC-Davis, he looks forward to more science and less administration. A proposal for a new BNF project has been submitted by Dr. Paul Gepts of UCD (another former Bliss student) with Bliss as a Co-PI. This proposal will likely be among the strongest to be considered by the TC.

Maxwell portion:
The Bliss and Maxwell projects were previously consolidated following the budget reduction and a recommendation by the BOD.

Following this recommendation, the BOD approved TC support for consolidating the new Maxwell focus on BGMV with the Dominican Republic/UNL project. A site visit by the TC contributed to this resolution (also see Maxwell proposal for strengthening this effort).

BRAZIL/BOYCE THOMPSON INSTITUTE

FY 86 RECOMMENDATIONS

None

FY 87 RECOMMENDATIONS

The project is important and should be afforded high priority. In the future, collaborative studies with IRRI in the Philippines and Senegal are contemplated. However, one institution that should be included is IITA in Nigeria.

What remains is to undertake extensive field trials to validate experimental results. The EEP recognizes the urgent importance of more practical, safe methods of insect control particularly in the major cowpea-producing regions of Africa and recommends consideration of adapting this approach in East and West Africa in collaboration with IITA.

RESPONSE TO RECOMMENDATIONS

While the TC and BOD supported the appropriateness of IITA collaboration (recall Shiv Singh, legume leader at IITA sits on TC), both groups also emphasized the need for the PI to carry through on the existing Brazil research (1) assuring no detrimental environmental or human impacts, (2) conducting socio-economic studies in the target areas and (3) initiating research under field conditions.

Project has US personnel working in Northeast Brazil among the poor, small-scale farmers. The MO has learned of the potential that all US efforts will be pulled out of Brazil because of nuclear proliferation. We have discussed this with the PI. The insect bio-control unit he has set up there and his contributions in general have been very well received.

CAMEROON/UNIVERSITY OF GEORGIA-PURDUE UNIVERSITY

FY 86 RECOMMENDATIONS

The Cameroon project is not being reviewed for FY 86 because plans are underway to restructure the project.

FY 87 RECOMMENDATIONS

This CRSP project, reorganized March 1, 1987, has been operating for less than one year; therefore, the usual review procedure is inappropriate at this time.

RESPONSE TO RECOMMENDATIONS

With the invaluable support of the US IR, this project was moved away from the UGA, restructured and, following TC evaluation of proposals and MO site visit to US institution, re-established at Purdue University. Murdock (from Purdue), Hall (TC) and Freed travelled to Cameroon and negotiated the change and HC support through the Mission.

DOMINICAN REPUBLIC/UNIVERSITY OF NEBRASKA

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
There is need at UPR to develop a selection and breeding strategy to improve disease resistance in large-seeded beans. The work on small-seeded beans may be useful for other countries.	In response to requests by the TC, the University of Nebraska/Dominican Republic and University of Puerto Rico/Honduras projects have been re-designed to be more consistent with the needs of the HCs and opportunities for effective collaborative research. The TC did not detect problems with the past or proposed focus with regard to seed size and color. The project is focusing on the development of cultivars but this may not be sufficiently emphasized in the log frame or reports. A modest amount of research on seed quality is deemed to be appropriate where necessary for cultivar improvement since the PI has expertise in this area. Attempts are being made to reduce the size of the payroll in the DR.
Efforts should be focused to evaluate materials over a wide range of environmental conditions in the DR to enhance progress in developing adapted and preferred varieties.	
Linkages with other projects within this CRSP should be improved.	
With the merger of the UNL and UPR components, the division of research seems to be progressing well and in a coordinated manner. The DR component should be reviewed in-depth to ascertain if improvements can be made in the process of developing adapted disease resistant and preferred cultivars. The review should also address the size of the payroll in the HC and the potential for institutionalizing a bean program in the DR as well as the appropriateness of hardness research at UNL and seed deterioration in storage research in the DR.	The TC notes that the CRSP project and CIAT were the only significant efforts in bean varietal improvement in the DR but a HC breeding program is now underway. Future project activities will be planned so that together with the HC projects an effective, overall general bean breeding program will be developed in the DR. The TC considers that the project is on-track and that further special evaluations are not needed at this time.
FY 87 RECOMMENDATIONS	
Bean productivity and production have declined significantly over the past five years, if the above data are accurate. USAID officials reported to EEP reviewers that DR statistics are unreliable; nevertheless, some assessment of what is happening to bean production in the DR should be made by CRSP officials.	Earlier concerns about the complementarity of this project and the DR/UPR project resulted in their consolidation. Another concern was the size of the CRSP-sponsored staff now paid 51 percent by the Ministry of Agriculture. The project was visited by the ME (Drs. Harpstead and D. Isleib) and following other meetings by a TC member. Representatives of the ME, there for another purpose, were able to discuss the CRSP. While the DR has accepted paying some of the CRSP salaries, the salary rate is so low that retention is a serious problem. While research progress is being made in the US institutions, DR impact is low and there are other management constraints. Yet the BOD did not accept the one-year extension suggested by the EEP, maintaining the three-
The following is quoted from the recent EEP Review conducted in the DR in November 1987: "Before any additional commitments are made to long-term, expensive out-of-country degree training, the PIs should consider preparation of an analysis of CRSP staffing requirements and develop a training plan through the next extension of the CRSP. Such an analysis and plan should reflect	

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
(a) the ability of the DR to retain highly-trained technicians/ scientists and (b) a realistic, DR-supportable staffing pattern for bean improvement in the DR."	year perspective as with the other projects. At the moment, we anticipate that Freed will be going to the Caribbean in the summer, including the DR, where the issues raised by the EEP can be explored. This project is slated for close monitoring.
A thorough review by the TC, MO, PIs and, perhaps, senior DR officials is needed to set funding priorities and an agreed course of action. It may be that an "understanding of bacterial genetic processes and gene transfer," for example, is not the most urgent need to get bean production up in the DR.	
Unfortunately, the scope of bean improvement in the DR appears to be limited mostly to that of the CRSP. This matter should be reviewed by the TC and MO, to determine if this is case and, if so, what can be done.	
The balance of domestic vs overseas activities with respect to program constraints should be reviewed in the light of the DR's pressing needs and the current relevancy of some of the work in Nebraska to those needs.	
During an EEP visit to the USAID Mission, officials ruled out direct support to the CRSP; thus, unless there is dramatic change, USAID involvement appears remote. Nevertheless, CRSP officials should continue their efforts to secure USAID support.	
The EEP suggests that this project receive extension for one year (May 1990). A limited extension period will avoid disruption of current activities, while providing time during the next regularly scheduled review for a thorough evaluation of the circumstances influencing bean research and production in the DR and the ways in which the CRSP is a part of and is influenced by these circumstances. This course of action is suggested because the signs and indicators are mixed and confusing. On the one hand, the project gives evidence of being an excellent research effort--outstanding researchers apparently making steady, substantive advances in knowledge and in developing improved, disease-resistant	

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
breeding lines in a highly favorable collaborative mode. Just what a project should be! On the other hand, the environment in which the project operates may be thwarting the effective application of research results. Before proceeding for several additional years with more of the same, CRSP and DR officials may wish to determine what are the most urgent bean production needs in the DR and how the proposed extension activities support them. In this connection, are the assumptions on which this project was organized still valid? It may be important to determine if activities sponsored by the CRSP should be limited to disease production constraints. Given its strong position of influence in the country, perhaps the CRSP could help the DR develop a more balanced bean improvement program, if review indicates that is what is needed.	

GUATEMALA/CORNELL UNIVERSITY

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
The Technical Committee is invited to determine whether more basic physiological-genetic work has reached a point of declining productivity and whether the work of this project cannot now be carried out entirely by ICTA.	The TC feels that major emphasis should be given to testing hypotheses concerning selection criteria and approaches for breeding for higher yields in beans. In addition, the controlled environment research which is useful for separating effects of different environmental factors such as temperature and photoperiod can only be done in Cornell, but this field work could be done in both New York State and Guatemala. The TC considered that a major problem of this project is that the reports are not adequate--they may give the impression that the project is mainly conducting basic physiological-genetic research, and this probably is incorrect.
FY 87 RECOMMENDATIONS	
The CRSP has provided support for this line of research for eight years and it builds on much previous research by the same US PI. The EEP believes it is now appropriate for an independent, external and in-depth review of the extension of this project. The EEP suggests an interim extension of this project pending the conclusions of the review.	Following TC review of the need to have a thorough review of this project, three non-CRSP reviewers have been identified and approved by the TC. We are presently trying to settle on an acceptable date.

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
	TC responses to the report recommendations will accompany its submission to the BOD.

HONDURAS/UNIVERSITY OF PUERTO RICO

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
Because of favorable policies and actions taken by the Government of Honduras, existing circumstances in Honduras and the urgent need for progress in bean improvement, the appropriateness of CRSP bean research arrangements should be re-appraised. The existing arrangement with the EAP may be satisfactory for CRSP activities. CRSP authorities may wish to discuss the arrangements, especially financial inputs, with the Director of Research, Ministry of Natural Resources, Government of Honduras, and secure an appropriate Memorandum of Understanding.	On behalf of the TC, J. Steadman visited the University of Puerto Rico and EAP/Honduras in November 1986 and M. W. Adams visited Honduras to assist in the re-design of this project. The TC response notes that the present MOU is with EAP, which has the authority for bean research in Honduras, and that this may be adequate. In response to requests from the TC, the CRSP support for collaboration between Honduras and UPR has been strengthened and linked to the DR/UNL project.
Given the location of the CRSP PI at the EAP in Zamorano Valley, CRSP officials may wish to monitor closely relationships with bean research at other Honduran locations under the Ministry of Natural Resources. In this connection, CRSP officials may wish to secure a Memorandum of Understanding that details the relationships between the EAP, the Ministry and the University of Puerto Rico. Perhaps an annual workplan for EAP/Ministry activities would be desirable.	Freed and Hortik recently visited EAP. Reports were favorable. Because of a terminal illness, the HC PI is being changed to the EAP faculty member who studied under Bliss. This project will be closely monitored. However, no transition problems are anticipated.

FY 87 RECOMMENDATIONS
If the TC and the ME/MO are satisfied with the plans to expand the project to include research on drought tolerance, early maturity and work using molecular biological techniques (i.e., if funds, expertise, facilities and other requirements are available), the EEP believes this request is acceptable for approval since the additions are needed and will complement and enhance the effectiveness of current activities.

INCAP/WASHINGTON STATE UNIVERSITY

FY 86 RECOMMENDATIONS

The External Evaluation Panel did not find it possible to evaluate the annual report as submitted. Similarly, the EEP was not convinced that the work proposed for 1987 could be accomplished with the CRSP budget as proposed. The EEP therefore requests that a revised report be submitted, confined strictly to work done in 1986 with CRSP funding and work proposed for 1987 with CRSP funding. The EEP reiterates the suggestion made at the last meeting that this project should concentrate on the hard-to-cook phenomenon. Such a restriction would allow a decrease in funding requirements.

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This project is conducting some imaginative research. However, there appear to be problems in coordination between the US and the HC components. It is possible that there is an overlap of efforts. Also, an increase in the collaboration between the two Guatemalan projects in this CRSP would enhance the application of the results.

The project should be extended but with heavy emphasis on incorporating findings into practical recommendations. The MO may wish to find ways to enhance the coordination between the US and the HC components so that it conveys the feeling of being a unified project whose efforts are more cumulative.

The EEP would welcome a systematic monographic account of the present state of knowledge of the different attributes that constitute the hard-to-cook phenomenon (including botanical, enzymological, biophysical, chemical and textural aspects) and of the possible methods of alleviating it by agronomic, breeding and culinary means with examples of past successes and failures.

RESPONSE TO RECOMMENDATIONS

The TC noted that advanced lines from ICTA are evaluated by INCAP for nutritional quality and that the present level of collaboration appears to be appropriate and that a greater emphasis on breeding for improved bean quality is not warranted at this time. The TC endorses the EEP suggestion that the MO seek ways for enhancing coordination between the US components. The TC endorses the EEP recommendation that the project produce the laboratory manual of bean quality aspects as soon as possible, and include in it a description of screening techniques for use by plant breeders.

The US PI was requested to re-write the 1986 annual report, which was subsequently distributed to the BOD. The project has been systematically reducing its size. The two Guatemalan projects have been encouraged to coordinate their efforts. The TC has agreed to make limited financial support available for a publication on the present knowledge concerning the hard-to-cook phenomenon.

MALAWI/MICHIGAN STATE UNIVERSITY

FY 86 RECOMMENDATIONS

Project is judged satisfactory; however, in January 1986 the EEP recommended that phase-out of this project be considered. The EEP reiterates this recommendation because the project appears to have completed its tasks and the EEP does not envision any further development gains in the short-term for Malawi by its continuation. We hope the diverse genetic materials and information will not be lost. The EEP encourages the completion of the analysis of 1984-86 socio-cultural data.

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With regard to the proposed three-year extension, there is no indication in the proposal that circumstances in Malawi with regard to Host Country support for the project have changed sufficiently to justify continuation as a CRSP project (see Report of the External Evaluation Panel, Bean/Cowpea CRSP Five-Year Review, January 19-24, 1986). If conditions have changed enough to warrant continuation (the recent EEP site review indicates they may have), CRSP authorities may wish to consider reorganizing and continuing CRSP activities in Malawi, given the sizeable CRSP investment in Malawi and the excellent working relations developed over the years.

The Malawi project has achieved most of the scientific goals set out in the original log frame. Moreover, it did this largely through the work of expatriate scientists, so that it has been regarded as insufficiently institutionalized in the HC institution, Bunda College. For these reasons it has been felt that the project should be terminated. However, there are important countervailing considerations:

A. The scientific objectives set out in the original log frame can now be seen to be incomplete; they were concerned with how diversity is maintained in populations of beans in Malawi, but not

RESPONSE TO RECOMMENDATIONS

The TC agreed that the project should be phased-out with respect to previous objectives and methods of operation, specifically the major dependence on expatriates for Host Country research. The possibility exists however for developing a new project in Malawi that would focus on the exploitation of the genetic diversity in Malawi to enhance the productivity and stability of bean production in collaboration with personnel at Bunda College.

The Malawi proposal was re-written with input from the Malawians. The new US PI, Tom Isleib, proposed by Michigan State University to take over after the retirement of M. W. Adams, has just returned from Malawi with the present Co-PI. There is enthusiasm and support from the HC for the continuation of this project. The TC has supported the proposed staff changes.

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS

with the reasons why farmers act as they do to maintain and control it. It now seems possible and necessary to study this in a further phase of socio-technical surveys.

B. The results of the studies of farms and farmers in Malawi have not yet been completely analyzed or published. It is essential to do this so that the work is not at risk of being wasted and because the rural service agencies of the Government of Malawi want the information and the results.

C. Although the project has identified lines (as well as populations [mixtures of lines]) which give large and stable yields, no materials have yet been made available to the Ministry of Agriculture--which expects to receive at least some before the project ends. The lines available seem also to include some which have useful levels of resistance to disease, some which are better adapted than others to dry conditions, and some which may fix more nitrogen than others. These materials should receive further attention.

D. The genetic resources of beans collected and assembled in Malawi have not yet been sufficiently evaluated, documented, or conserved.

E. The publication of past work is not complete.

F. The Department of Crop Production at Bunda College now includes a team of Malawian scientists, four of whom were trained by the CRSP. Although their salaries will be paid from the College budget, these graduates need external help to enable them to take up their collective research duties for the Government of Malawi, which gave the College responsibility for the national bean program several years ago. The Government has not been able to provide

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
fully adequate funding. As these new researchers develop their work, the project and its activity should become securely institutionalized in the country and other sources of support should be found. The return of the Ph.D. student in food science will further strengthen the team.	
G. The US PI, Dr. Adams, has proposed an extension based largely on a study of a scientific topic new to the CRSP, the co-evolution of cultigens and pathogens in the two main races (Andean and Central American) of beans. This is a long-term scientific undertaking whose practical outcomes would inevitably be some distance ahead. It does not attract great enthusiam from the EEP or from the Malawi Ministry of Agriculture, which is understandably concerned with more immediate developmental benefits.	
The EEP recommends that Bean/Cowpea CRSP activities in Malawi be continued for an additional three years, if the project can be re-structured to more closely address national bean improvement needs as agreed to and supported by the Ministry of Agriculture and Bunda College. The EEP does not recommend approval of the extension proposal in its present form.	

MEXICO/MICHIGAN STATE UNIVERSITY

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
Satisfactory for continuation with the recommendation that close attention be given to the specific agro-ecological circumstances in which droughts arise in different experimental situations.	The TC response noted that in the studies in Mexico, rainfall, evaporative demand and soil moisture status are being monitored. It is recognized that the droughts being imposed in greenhouse and field studies in Michigan will be different from those occurring in the field studies in Mexico. However, the objective of the US research is to obtain more basic information on mechanisms of drought resistance, and any lines selected for drought resistance in the US will be evaluated in Mexico.

FY 87 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
This important project is critical to large areas and millions of people both in LDCs and the US where seasonal droughts occur; therefore, the EEP recommends continuation of drought studies on beans.	The retirement of M. W. Adams is also the motivation for staff changes in this project. These changes, worked out with MSU administrators, have been reviewed and approved by the TC and BOD. A new proposal is not needed because most of the US and HC will continue the approved and important work.

NIGERIA/UNIVERSITY OF GEORGIA

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
No specific recommendations.	The MO continues to monitor this project. It is of particular interest to the WID Specialist because of the appropriateness of its subject matter to women's domestic and food preparation, rather than their food production, roles. The WID Specialist travelled with the US team to Nigeria in 1987 and participated in extension proposal discussions and development of the scope of work.
FY 87 RECOMMENDATIONS	
No specific recommendations.	

SENEGAL/UNIVERSITY OF CALIFORNIA-RIVERSIDE

FY 86 RECOMMENDATIONS	RESPONSE TO RECOMMENDATIONS
The seasonal weather of the sites of the multilocational trials should be studied. The 1987 program will therefore be much like 1986, but just as it is important to know about the hydrologic balances of the sites of multilocation and minikit trials, it must be important to describe the conditions at UCR and other experimental sites also.	The TC noted that weather and irrigation data are collected on all experimental sites in California, and data on soil moisture content are collected on some experiments. The extent and types of analyses conducted with these data depend upon the specific objectives of the experiment and are presented when the results of the experiments are published.
FY 87 RECOMMENDATIONS	
The reports suggest that the sole linkage within Senegal is with ISRA, but it is possible that ISRA in its turn has links with other agencies of the Government of Senegal and with the University Cheick Anta Diop of Dakar (formerly the University of Dakar) and technical training institutions in agricultural science and technology. This should be explored.	EEP recommendations have been discussed with the US PI, who is Chair of the TC and in frequent communication with the MO.

TANZANIA/WASHINGTON STATE UNIVERSITY

FY 86 RECOMMENDATIONS

the senior entomological cooperator, Dr. Karel, is expected to leave in 1987; it is most important that his work should be continued.

FY 87 RECOMMENDATIONS

The main materials provided for review, apart from reports by the HC and US PIs, are the reports of the fifth and sixth bean workshops held at Sokoine University of Agriculture in 1986 and 1987 and the 1988 EEP review in Tanzania. These workshops are now established as an important regular event in East Africa.

The first report is a professionally worthy document, but the second leaves much to be desired. The two PIs should review it before it is published, in order to ensure that it is a worthy successor to the 1986 report.

It is stated that inoculation with Rhizobium doubled yields even in very poor soils, but the report from the 1987 workshop omits the essential table of yields. Nevertheless, inoculants are being increased for sale to farmers--though by what means is not clear. This project should continue to ensure that whatever researchers and governments may wish to do about inoculation in the field, researchers also search for lines which are good at fixing nitrogen with indigenous Rhizobium. The EEP review suggests that this line of research has enormous potential.

RESPONSE TO RECOMMENDATIONS

Bunting, Rachie and Barnes-McConnell held a HC site review during which a number of EEP concerns were addressed. Essentially, the review assured the team that the work was in good hands albeit limited by meager HC resources.

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